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OF
NORTH AMERICA

JUNE, 1937

VOLUME 17—NUMBER 3

LAHEY CLINIC NUMBER
BOSTON, MASS

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CONTENTS

	PAGE
SYMPOSIUM ON GASTRO-INTESTINAL SURGERY	599
The Common Esophageal Disorders Their Diagnosis and Treatment By DR. WALTER B. HOOVER	601
The Indications for Surgery in Peptic Ulcer By DR. FRANK H. LAHEY	611
Carcinoma of the Stomach An Analysis of 291 Cases By DRS. SAMUEL F. MARSHALL AND EARL S. TAYLOR	629
Factors Influencing the Surgical Relief and Cure of Carcinoma of the Stomach By DR. EVERETT D. KIEFER	651
Anesthesia for Gastrointestinal Surgery By DR. LINCOLN F. SEIZ	655
The Place of the Billroth I Operation in Subtotal Gastrectomy By DRS. RICHARD B. CATTELL AND BENTLEY P. COLCOCK	657
Treatment of Bleeding Duodenal Ulcer By DR. FRANK H. LAHEY	687
Technical Difficulties with Gastric Resection By DR. FRANK H. LAHEY	693
Postoperative Complications Following Subtotal Gastrectomy By DR. SAMUEL F. MARSHALL	705
Dietary Care After Subtotal Gastrectomy By DR. S. ALLEN WILKINSON	717
Gastrointestinal Symptoms in Patients with Heart Disease By DR. LEWIS M. HURNTHAL	721
Earlier Operations in Cholelithiasis By DR. FRANK H. LAHEY	725
The Technique of Cholecystectomy and Choledochostomy By DR. RICHARD B. CATTELL	731
Gallbladder Disease and Diabetes By DR. FRANK N. ALLAN	743
Carcinoma of the Pancreas By DR. FRANK H. LAHEY	753
Regional Ileitis By DR. HERBERT D. ADAMS	763
The Clinical Value of Morphine and Pituitary Extract Pitressin in Abdominal Surgery By DR. HERBERT D. ADAMS	773
Diverticula of the Gastrointestinal Tract By DR. RICHARD G. WHITING	779
The Surgical Management of Fecal Fistula By DR. SAMUEL F. MARSHALL	787
Colectomy for Intractable Ulcerative Colitis By DR. RICHARD B. CATTELL	803
Cancer of the Digestive Tract in the Young By DRS. SARA M. JORDAN AND DONALD T. CALDWELL	815
Carcinoma of the Rectum By DR. RICHARD B. CATTELL	831

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SYMPOSIUM ON GASTRO INTESTINAL SURGERY

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- Frank H Lahey THE INDICATIONS FOR SURGERY IN PEPTIC ULCER
- Samuel F Marshall and Earl S Taylor CARCINOMA OF THE STOMACH AN ANALYSIS OF 291 CASES
- Everett D Kiefer FACTORS INFLUENCING THE SURGICAL RELIEF AND CURE OF CARCINOMA OF THE STOMACH
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- Frank N Allan GALLBLADDER DISEASE AND DIABETES
- Frank H Lahey CARCINOMA OF THE PANCREAS
- Herbert D Adams REGIONAL ILEITIS
- Herbert D Adams THE CLINICAL VALUE OF MORPHINE AND PITUITARY EXTRACT FITNESS IN ABDOMINAL SURGERY
- Richard G Whiting DIVERTICULA OF THE GASTRO INTESTINAL TRACT
- Samuel F Marshall THE SURGICAL MANAGEMENT OF FECAL FISTULA

CONTENTS

	PAGE
Urinary Tract Complications Following Radical Resection of the Recto-sigmoid	817
By DR. JAMES B. HICKS	
The Differential Diagnosis of Rectal Bleeding	831
By DR. EVERETT D. KIEFER	
Pruritus Ani	845
By DR. NEIL W. SWINTON	
Amebiasis with Carcinoma of the Colon	853
By DR. DONALD T. CHAMBERLIN	
The Significance and Treatment of Colonic and Rectal Polyps	857
By DRS. RICHARD B. CATTELL AND NEIL W. SWINTON	
x Ray Treatment of Cancer of the Colon and Rectum: A Negative Report	865
By DR. HUGH F. HARE	
Anorectal Fistulae	881
By DR. NEIL W. SWINTON	
The Prevention and Treatment of Postoperative Pulmonary Complications by Bronchoscopic Aspiration	895
By DRS. REEVE H. BETTS AND RICHARD H. OVERHOLT	
Clinical Investigation of Primary Malignancy of the Lung: Diagnosis and Operability	905
By DR. RICHARD H. OVERHOLT	
Benign Intrathoracic Tumors	905
By DRS. RICHARD H. OVERHOLT AND CARLTON R. SOUDERS	
The Use of Unpadded Casts with Walking Irons in Fractures Below the Knee	911
By DRS. GILBERT E. HIGGART AND GEORGE C. BAILEY	
Presacral Neurectomy in the Treatment of Dysmenorrhea	917
By DRS. SAMUEL F. MARSHALL AND JAMES L. POPPEN	
Cumulative Index	937

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	PAGE
Urinary Tract Complications Following Radical Resection of the Recto- sigmoid	817
By DR. JAMES B. HICKS	
The Differential Diagnosis of Rectal Bleeding	831
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By DRS. RICHARD B. CATTELL AND NEIL W. SWINTON	
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By DR. HUGH F. HARE	
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<hr/>	
Cumulative Index	937

THE COMMON ESOPHAGEAL DISORDERS THEIR DIAGNOSIS AND TREATMENT

WALTER B. HOOVER

IN this paper some of the more common esophageal disorders with illustrative cases will be presented with the method of examination for diagnosis and the treatment indicated.

The most important consideration in the diagnosis of esophageal disease is first that the physician recognize that abnormal esophageal conditions or disease does exist that it is fairly common and that symptoms are produced by such abnormalities. Esophageal disease is very commonly overlooked by the physician because esophageal disease has been given little consideration outside of the nose and throat specialty and even here it is further limited mostly to the endoscopist. Secondly because the esophagus is inaccessible for examination without special instruments and x ray and thirdly that the diagnosis of nervousness and globus hystericus has been overworked by many practitioners and has acted as a placebo to the unsolved diagnostic problems.

Anatomically the esophagus is a stratified epithelial lined muscular tube extending from the pharynx to the stomach. The upper portion of the esophagus is kept closed except on swallowing by the inferior constrictor muscle of the pharynx often called the cricopharyngeus muscle. The esophagus is somewhat narrowed at the upper thoracic aperture again at the level of the fourth thoracic vertebra where it is pressed upon by the arch of the aorta also at the level of the fifth vertebra where it is crossed by the left main bronchus and again where it passes through the diaphragmatic hiatus past the lobe of the liver to the stomach. There are two muscular layers of the esophagus an inner circular and an outer longitudinal

Richard B Cattell COLECTOMY FOR INTRACTABLE ULCERATIVE COLITIS

Sara M Jordan and Donald T Chamberlin CANCER OF THE DIGESTIVE TRACT
IN THE YOUNG

Richard B Cattell CARCINOMA OF THE RECTUM

James B Hicks URINARY TRACT COMPLICATIONS FOLLOWING RADICAL RESEC-
TION OF THE RECTOSIGMOID

Everett D Kiefer DIFFERENTIAL DIAGNOSIS OF RECTAL BLEEDING.

Neil W Swinton PRURITUS ANI

Donald T Chamberlin AMEBIASIS WITH CARCINOMA OF THE COLON

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A NEGATIVE REPORT

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Reeve H Betts and Richard H Overholt THE PREVENTION AND TREATMENT
OF POSTOPERATIVE PULMONARY COMPLICATIONS BY BRONCHOSCOPIC AS-
PIRATION

absence of secretion in this area and the presence or absence of paralysis of the pharyngeal wall and laryngeal muscles and the presence or absence of the pharyngeal reflexes

The next step in the esophageal examination should be before the fluoroscopic screen with radiopaque mixture the thick mixture the thin mixture and the capsules containing bismuth to be used as indicated by the history and the findings with the fluoroscope Also the patient is to be rotated before the fluoroscopic screen in order to best visualize all portions of the esophagus Not only should the patient be examined in the upright position but he should also be examined in the prone position for the possibility of herniation of the stomach or a small portion of the stomach into the chest cavity One must observe also the entire chest the neck and the stomach for evidences of lesions in these regions or tumors which may cause pressure on the esophagus from without The fluoroscopic examination should be further supplemented by the taking of plates when and where indicated and for the purpose of permanent record

The laboratory examinations consisting of serology hemoglobin red count differential count and white count must not be neglected for esophageal difficulties are associated with luetic infections the leukemias and anemia

Following the history general physical examination the special examination of the pharynx and larynx the fluoroscopic examination of the chest and esophagus and the laboratory examinations the examination of the esophagus under direct vision is indicated unless some contraindication is found on such examinations This esophagoscopy examination is done by the passage of the esophagoscope to inspect the esophagus from the pharynx to and sometimes including the stomach During this examination a biopsy may be obtained by appropriate forceps this makes tissue study and diagnosis possible

Some of the more common esophageal conditions are as follows (1) so-called cardiospasm (2) diverticula of the hypopharynx and esophagus (3) cicatricial stenosis or strictures of the esophagus following trauma and caustics such as

Both plain and striated muscle is found in the esophagus and the muscular coats propel the bolus of food from the pharynx to the stomach. Any condition which interferes with the passage of food or fluid through the esophagus will most probably give symptoms and as a rule the severity of the symptoms depends largely upon the completeness of the obstruction to the passage of food through the tube.

As in all diagnostic problems a careful history and evaluation of the patient's complaints is essential. The cardinal symptom of esophageal dysfunction is difficulty in swallowing. The severity of the symptoms varies from an effort to swallow or a sense of fullness under the sternum produced by swallowing or a sense of pressure in the chest to complete inability to swallow with regurgitation of all food taken. The laryngeal symptoms of coughing or choking are frequently associated with difficulty in swallowing. Attempting to swallow may force food or fluid into the larynx especially in the presence of esophageal obstruction or aspiration may result from the accumulated material in the hypopharynx about the larynx.

In taking a history it is well to ascertain the duration of symptoms, any progressive increase in symptoms, any remission of symptoms, what means a patient has developed to overcome his symptoms, what type of food is best tolerated and what type least tolerated, whether there has been pain or not, if there has been a change in voice, if there has been loss of

recent or severe infection, any evidence of paralysis, intracranial hemorrhage or shock, and so forth.

The history should be followed by a careful routine physical examination in which must be included a blood pressure, state of the organs of the neck, chest, abdomen and the central nervous system. This examination should be supplemented by an indirect laryngeal examination which records the presence or absence of a lesion of the tongue, pharynx, hypopharynx and larynx. Also it should record the presence or

ulceration leukoplakia and the area of narrowing at the lower end must be visualized to rule out the presence of ulcer with stricture or new growth with stricture. The esophagus may be inflated during the examination, and as a rule the tube can be passed through the narrowed area without undue pressure into the stomach. The passage of the esophagoscope in itself often acts as a dilator with some beneficial effects. However, at this time I employ the use of the Tucker dilator which is a modified Plummer dilator, which may be passed through the esophagoscope the esophagoscope withdrawn and the cardia dilated by inflation.

Treatment—The treatment followed here in the clinic is that of dilatation of the narrowed or stenosed lower end of the esophagus. This is done with a modified Plummer bag using air pressure with a gauge. The initial dilatation is always done before the fluoroscope with the barium striped bag of the Plummer type and the size of the dilatation observed. Usually at the first sitting only about 5 or 6 pounds of pressure are used or pressure enough to give the patient considerable pain, or until the dilating bag reaches 1 inch in diameter at its narrow portion in the diaphragmatic region. Usually marked improvement results from the dilatation and even one such dilatation has relieved some patients from their symptoms for a number of years. Most patients however require further dilatations, and in such cases the amount of pressure is increased and the size of the bag also increased from time to time.

In the large majority of cases the passage of this dilator is quickly and easily carried out. However in the cases where there is an elongation of the esophagus with a double curve at the lower end the passage of the instrument may be difficult. It may tax the patience of both the patient and the doctor and in such cases the swallowing of a thread and the use of a flexible weighted Mosher tip will be found to be an invaluable aid in overcoming the difficulties of the double curve.

It is remarkable the cooperation given by most patients during this treatment. However a few highly strung neurotic women and occasionally a man will not submit to instrumen

lye, acids foreign bodies and ulcers, webs of the esophagus cancer of the esophagus and central nervous system disease affecting deglutition

Cardiospasm, also known as achalasia and preentriculosis (a term applied by Jackson), may be defined as a stenosis either functional or fibrotic of the lower end of the esophagus, usually associated with dilatation of the esophagus above the constricted area

The history and symptoms vary greatly. However, most patients with this condition complain of difficulty in eating a full meal, that they have pressure under the sternum, that they can feel food pass from under the chest into the stomach, or that they have to force food into the stomach by swallowing air or fluid, and the regurgitation or vomiting of undigested or unchanged food. I have seen cardiospasm in a child at the age of nine years and in both men and women over seventy. It is more common, however, in middle aged adults. The symptoms may have been present for only a few months to many years but no matter how typical the history and other findings the true diagnosis is made by the fluoroscopic examination with x ray plates and the esophagosopic examination. The x ray usually reveals a smooth conical opening from the esophagus into the stomach. The dilatation of the esophagus above the stricture depends largely on the duration of symptoms. This varies from moderate dilatation to marked dilatation with elongation forming an S like curve at the lower end and with pocketing or haustra like formation in the upper portion. The esophagus may contain from 1 or 2 up to 40-50 ounces, in cases of long standing with marked dilatation. Following the fluoroscopic examination the direct examination with the esophagoscope should be done. Before this examination however, it is well especially in the cases of dilated esophaguses to cleanse the esophagus by having the patient drink fluids and regurgitate them, or by using an ordinary stomach tube passing it to the lower end of the esophagus and lavaging it as one would lavage the stomach. During the esophagosopic examination the walls may be examined for

ulceration leukoplakia and the area of narrowing at the lower end must be visualized to rule out the presence of ulcer with stricture or new growth with stricture. The esophagus may be inflated during the examination and as a rule the tube can be passed through the narrowed area without undue pressure into the stomach. The passage of the esophagoscope in itself often acts as a dilator with some beneficial effects. However at this time I employ the use of the Tucker dilator which is a modified Plummer dilator which may be passed through the esophagoscope the esophagoscope withdrawn and the cardia dilated by inflation.

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In the large majority of cases the passage of this dilator is quickly and easily carried out. However in the cases where there is an elongation of the esophagus with a double curve at the lower end the passage of the instrument may be difficult. It may tax the patience of both the patient and the doctor and in such cases the swallowing of a thread and the use of a flexible weighted Mosher tip will be found to be an invaluable aid in overcoming the difficulties of the double curve.

It is remarkable the cooperation given by most patients during this treatment. However a few highly strung neurotic women and occasionally a man will not submit to instrumen

tation without anesthesia and in such cases the dilatation with a modified Plummer bag of Tucker through the esophagoscope or the passage of the ordinary Plummer bag before the fluoroscope under general anesthesia gives excellent results

In addition to the dilatation it is well to instruct the patient to take a bland smooth diet which is to be well chewed and to avoid especially all raw fruits and vegetables and the heavier stringy meats also warm foods and drinks seem to be better tolerated than cold drinks The more nervous individuals are sometimes markedly improved by the use of phenobarbital and tincture of belladonna Those patients with the large esophagus where there is a great deal of retained secretion are instructed to lavage the esophagus either with a tube or by drinking warm water and regurgitating it before retiring at night

The treatment of this condition is most gratifying Often complete relief is afforded with 1 to 5 treatments On the other hand many treatments may be required and the treatments may extend over a period of a few years but even so such patients received marked benefit and often are nearly symptom free In my experience it is the long standing cases with the elongated esophagus with the double curve at the lower end that have the most difficulty and which require the greatest amount of treatment but such cases may be entirely relieved of symptoms

Case Report Cardiospasm—Mr J T age twenty seven years Difficulty in swallowing since age of seven years Recently pain in chest loss of 15 pounds weight in the past month Vomits nearly all his food x Ray large esophagus with haustra like markings in upper portion elongation with S curve at lower end Esophagosopic examination marked esophagitis lower end of esophagus smooth No ulcer or new growth Diagnosis cardiospasm Treatment repeated dilations with Plummer dilator before the fluoroscope Marked improvement

Pharyngo esophageal Diverticulum—The cause for this condition is not entirely understood yet we believe it to

be due to an obstruction to the passage of food into the upper end of the esophagus. Anatomically the lesion occurs on the posterior pharyngeal wall at its lowermost portion just above the cricopharyngeus muscle.

These diverticula occur in both sexes, but it is more common in males than females, at a ratio of about 4 to 1. It is more common in middle life and we have noted cases in the early twenties and a beginning diverticulum in the eighties.



Fig. 16'—Mr. J. T. See case report.

The duration of symptoms may vary from a few weeks to many years and the diverticulum may vary in size from a one cent piece to the size of a large orange. The symptoms to a considerable extent depend on the size of the lesion. The more common early symptoms are difficulty in swallowing, the presence of mucus in the throat, inability to entirely clear the throat, something catching in the throat or choking, or pharyngeal irritation or cough. As the pouch increases in size usually dysphagia increases. The swallowing of pulpy food and coarser meats is especially difficult. The regurgitation of foods

tation without anesthesia and in such cases the dilatation with a modified Plummer bag of Tucker through the esophagoscope or the passage of the ordinary Plummer bag before the fluoroscope under general anesthesia gives excellent results.

In addition to the dilatation it is well to instruct the patient to take a bland smooth diet which is to be well chewed and to avoid especially all raw fruits and vegetables and the heavier stringy meats also warm foods and drinks seem to be better tolerated than cold drinks. The more nervous individuals are sometimes markedly improved by the use of phenobarbital and tincture of belladonna. Those patients with the large esophagus where there is a great deal of retained secretion are instructed to lavage the esophagus either with a tube or by drinking warm water and regurgitating it before retiring at night.

The treatment of this condition is most gratifying. Often complete relief is afforded with 1 to 5 treatments. On the other hand many treatments may be required and the treatments may extend over a period of a few years but even so such patients received marked benefit and often are nearly symptom free. In my experience it is the long standing cases with the elongated esophagus with the double curve at the lower end that have the most difficulty and which require the greatest amount of treatment but such cases may be entirely relieved of symptoms.

Case Report Cardiospasm—Mr J. T. age twenty seven years. Difficulty in swallowing since age of seven years. Recently pain in chest loss of 15 pounds weight in the past month. Vomits nearly all his food. x Ray large esophagus with haustra like markings in upper portion elongation with S curve at lower end. Esophagoscopic examination marked esophagitis lower end of esophagus smooth. No ulcer or new growth. Diagnosis cardiospasm. Treatment repeated dilatations with Plummer dilator before the fluoroscope. Marked improvement.

Pharyngo esophageal Diverticulum—The cause for this condition is not entirely understood yet we believe it to

healed and here again we use the pneumonic bag over a previously swallowed string as a guide. The upper portion of the esophagus is dilated to about $\frac{3}{4}$ to 1 inch in diameter and on some occasions even larger using from 5 to 10 pounds pressure in the pneumonic dilator.

Esophageal Diverticulum—Case report Mrs J R aged eighty six. Complained of a severe choking spell. Laryngeal examination normal. mucus in the hypopharynx. x Ray—



Fig 163

Fig 163 Mrs J R Anterior or posterior view showing diverticulum



Fig 164

Fig 164 Mrs J R Lateral view

small diverticulum size of penny when full. This illustrates an early diverticulum in late life and a type that may be relieved by dilatations.

Esophageal Diverticulum—Case report Mrs A C H aged fifty nine years. Known symptoms over ten years. x Ray diagnosis over ten years. Increasing size and increasing symptoms. Recent weight loss of 20 pounds. Note size in the anterior posterior view and the displacement of the trachea for

which have been taken some hours or days previously is quite common. As the sac increases further in size there is a bulging and gurgling in the neck or throat. Malnutrition and loss of weight follow marked dysphagia.

The diagnosis is made by the x ray and should be further confirmed by the direct esophageal examination.

Treatment—The treatment for the cure of their condition is surgical. I wish however to emphasize a few points concerning the treatment in a case in which a surgical procedure cannot be carried out immediately because of the patient's poor condition or lack of consent. Such a patient should be taught to care for his pouch by washing it out and this may be done after each meal and at bedtime by the patient's drinking warm water filling his pouch leaning well forward and then using pressure on the neck to empty the pouch. He should also be instructed to chew his food well to take a softer or more smooth food and swallowing may be facilitated by certain positions with pressure upon the neck. In extreme cases of malnutrition a gastrostomy must be considered. Also dilatation of the cricopharyngeus muscle usually makes the swallowing very much more easy. This dilatation should be done under direct vision here again the Tucker Plummer dilator may be used or dilatation can be performed blindly using the previously swallowed string as a guide following the method of Plummer and using a barium striped pneumonic bag before the fluoroscope. The two stage operation is used by us because of its safety. In 70 consecutive operations there has been but 1 death and this due to uremia in a man of eighty five. The results otherwise have been good except for four recurrences one of which was reoperated. A careful complete dissection of the neck of the sac is essential.

Due to the constricting action of the cricopharyngeus muscle we feel that these muscle fibers should be divided at the time of operation which will tend to prevent recurrence of a diverticulum.

We believe dilatations postoperatively are worth while and further tend to prevent recurrence when the wound is well

healed and here again we use the pneumonic bag over a previously swallowed string as a guide. The upper portion of the esophagus is dilated to about $\frac{3}{4}$ to 1 inch in diameter, and on some occasions even larger, using from 5 to 10 pounds' pressure in the pneumonic dilator.

Esophageal Diverticulum—Case report, Mrs J R, aged eighty six. Complained of a severe choking spell. Laryngeal examination normal. mucus in the hypopharynx. x Ray—



Fig 163

Fig 163—Mrs J R. Anterior posterior view showing diverticulum.



Fig 164

Fig 164—Mrs J R. Lateral view.

small diverticulum size of penny when full. This illustrates an early diverticulum in late life and a type that may be relieved by dilatations.

Esophageal Diverticulum—Case report, Mrs A C H, aged fifty nine years. Known symptoms over ten years. x Ray diagnosis over ten years increasing size and increasing symptoms. Recent weight loss of 20 pounds. Note size in the anterior-posterior view and the displacement of the trachea for-

ward by the filled pouch in the lateral view. Note contrast with Figs 163, 164. A two stage operation performed with good result.

Traction diverticula are usually produced by periesophageal inflammation, usually arising in lymph glands along the course of the esophagus. These glands may become attached to the esophagus, even ulcerate into it and drain into its lumen. In healing the contraction of the scars produce a diverticulum or pouch or the ulcerated cavity becomes epithe-



Fig 165

Fig 165—Mrs A C H. Anterior posterior view. large diverticulum.



Fig 166

Fig 166—Mrs A C H. Lateral view.

lialized. The diagnosis of this condition is usually made in adults; however, it is occasionally found in children. Frequently traction diverticula do not cause symptoms, but are found in the routine fluoroscopic examination of the esophagus during gastro-intestinal series. On the other hand many people with this condition do have gastro-intestinal symptoms that may be related to the esophageal diverticulum. Many of these diverticula do fill with food and cause some difficulty in swal-

lowing. Frequently discomfort is complained of in the chest and under the sternum. This discomfort may be due to other glands involved in a similar inflammatory process, usually a tubercular process which produced the diverticula. Often some stenosis is produced and in such case dilatation is indicated. After dilatation has been accomplished the symptoms are usually relieved.

Traction Diverticulum—Case report Mr. H. S., aged fifty-five. Complained of weakness and pressure under sternum.



Fig. 167—Mr. H. S. Traction diverticulum

x Ray traction diverticulum. Esophagoscopy confirmed diagnosis. Dental sepsis cleared up. Relieved of symptoms following spontaneous rupture and discharge of para-esophageal glands into the esophagus.

Web of the Esophagus—Webs or thin membranous obstruction of the esophagus may be congenital or result from the healing of the lesion in the esophagus. It is my feeling that the congenital lesions are fairly rare while the acquired ones are fairly common. Mosher has shown that inflammatory

changes in the esophageal wall are relatively common associated with inflammatory disease elsewhere in the body

Here again the symptoms of a web are difficulty in swallowing especially solids and the more complete the web the more marked the symptoms. In my experience the more common location for webs is near the upper end of the esophagus at the postcricoid region where webs frequently may nearly occlude the lumen or only a portion of the esophageal lumen. A web however may be found at any level in the esophagus. The diagnosis here rests again on the fluoroscopic examination the use of the barium capsule is often helpful but the most important diagnostic method is the passage of an open mouth esophageal speculum through which the esophageal web may be visualized. The treatment employed is the gradual dilatation of the web or the cutting or breaking of a web to establish a normal lumen. Great care must be exercised as break in the esophageal wall usually results in mediastinitis and death. The results are most gratifying and only occasionally do the webs recur.

The syndrome of anemia glossitis and dysphagia also known as the Plummer Vinson syndrome is closely associated with web formation and web formation has been found in over 40 per cent of the cases of this condition which have come under our observation. This syndrome is characterized by an anemia of the hypochromatic type a smooth somewhat atrophic tongue often red and difficulty in swallowing. In such cases the passage of the esophagoscope or dilators will relieve the dysphagia by dilating the obstructed region but the anemia must be treated in order to relieve the patient's general symptoms. Adequate iron therapy will relieve nearly all cases however the use of liver is beneficial in a few.

Web of Esophagus—Case report a web with the syndrome of anemia glossitis and dysphagia. Mrs. E. G. age sixty dysphagia for solid food for several years also weakness and fatigue. Known to have anemia for several years. x Ray web and stenosis visualized. Esophagoscopy examination

membranous web almost occluding the esophageal lumen Web cut with punch forceps and speculum passed for dilatation Complete relief of dysphagia and hemoglobin arose from 57 to 90 per cent by adequate iron therapy

Strictures of the Esophagus—Benign or simple stricture of the esophagus is a narrowing of the esophageal lumen usually the result of scar tissue contraction from healing lesions of the esophagus The more common method of production is from inflammatory changes associated with general disease from the healing of ulceration produced by tubercular glands near the esophagus the healing of peptic ulcer of the esophagus the healing of ulcerations produced by traumatic means such as ulceration resulting from the sojourn of a foreign body the swallowing of caustic fluids as lye and acids The strictures resulting from such lesions vary from a small web to practically complete total obliteration of the esophageal lumen There may be one or multiple strictures in a single case and the nutrition of the patient may scarcely be interfered with or produce complete starvation The diagnosis is made by the use of the fluoroscopic examination the x ray plate and the esophagoscope

The object of treatment in these cases is to maintain nutrition and to reestablish normal deglutition In the more simple cases this can be done by gradual dilatation with direct guidance of the esophagoscope or by the passage of bougies either with or without the previously swallowed string as a guide following the method of Plummer

When nutrition is markedly interfered with a gastrostomy must be done to maintain nutrition and if there is not complete obliteration of the esophagus the swallowed string or thread may be pulled out through the gastrostomy opening and retrograde dilatations given following the method of Tucker with gradually increasing rubber dilators This method is especially useful in multiple strictures and especially if there is dilatation of the esophagus above the strictures so that the passage of dilators from above is dangerous Such patients must be followed for many years as difficulty with further con

tracture may take place even five or ten years after an apparently normal lumen of the esophagus has been established

Esophageal Stricture (Lye)—Case report, Miss M. S., age thirty six years, swallowed lye at age of three years. Gastrostomy and retrograde dilatation 1904 to 1911. Irregular dilatation since from above. Recent acute esophagitis with



Fig. 168—Miss M. S. Lye stricture of esophagus

almost complete obstruction and ulceration in the lumen. Note marked stricture of the middle third in Fig. 168.

Case Report—Mrs. G. Total gastrectomy for carcinoma of stomach followed by stricture at the anastomosis of the esophagus to the jejunum with difficulty of swallowing of even liquids. Complete relief of obstruction following dilatation over a previously swallowed silk thread. In Fig. 169 the lower end of the esophagus is filled with a bismuth mixture smooth in outline with the feathering of the jejunum.

Peptic Ulcer of the Esophagus—In our experience an ulceration of the lower end of the esophagus is not uncommon. It is usually associated with some spasm of the lower end of the esophagus, and there is associated pain and difficulty in

swallowing. Most of these ulcers have shown tendency to healing with some contraction and stricture formation. Two of our cases have had serious hemorrhages. In making the diagnosis the fluoroscope usually reveals an abnormality, and the direct inspection with the esophagoscope and with biopsy confirms the diagnosis. The surgical treatment is only that of dilatation when narrowing of the lower end of the esophagus exists causing obstruction. The rest of the treatment is medical using a routine ulcer management. The patient should ab-



Fig. 169 Mrs. G. Esophageal jejunal anastomosis showing stricture.

stain from smoking and drinking. Elevation of the head and shoulder when lying down or during sleep is beneficial in some cases.

Carcinoma of the Esophagus—Malignant disease of the esophagus remains one of the most discouraging diseases to treat. The diagnosis is usually made late and the treatment administered can only be palliative. The early symptoms are vague and are not serious enough to make these patients seek relief or if the patient does seek relief it is only rarely that

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Peptic Ulcer of the Esophagus—In our experience an ulceration of the lower end of the esophagus is not uncommon. It is usually associated with some spasm of the lower end of the esophagus and there is associated pain and difficulty in

nourishing diet and to rinse the esophagus after eating to prevent the accumulation of fermenting material in the lesion

Where the esophageal lesion is obstructive the use of dilatation frequently gives very gratifying results. Intubation where the tubes are well retained is helpful. The use of radium likewise has given good palliative results for a few weeks or months. When the lumen of the esophagus cannot be maintained a gastrostomy must be done to prevent starvation. However most patients with a gastrostomy and carcinoma of the esophagus are not particularly happy. To date the surgical removal of carcinoma in the thoracic esophagus has in most instances resulted in failure. The removal of carcinoma in the cervical esophagus has met with some success and I wish to report one case in which a carcinoma was removed three and one half years ago and in which the function of swallowing has been maintained.

Case Report —Mrs M G age forty nine came to the clinic with a chief complaint of discomfort in her throat. She was referred by her family physician who had recently had some experience with carcinoma of the esophagus and who was suspicious of her condition. A diagnosis was made by a direct esophageal examination which revealed the lesion about the size of a 10 cent piece below the cricopharyngeus muscle on the right side of the esophagus. A biopsy was taken. A two stage lateral resection was planned and in the first operation the lateral pharyngeal wall and upper esophagus were exposed. After one week a second operation was done removing all but about a $\frac{1}{4}$ inch strip of the esophagus over a distance of 11 inches from the cricopharyngeus downward entirely removing the lesion. A feeding tube was placed through the nose the wound was allowed to granulate in and the patient fed through the tube. After the wound had been healed on the outside a thread was forced down the tube to act as a guide during dilatation. The feeding tube was withdrawn. The patient was able to swallow and the esophagus was kept dilated from time to time until epithelization had taken place.

the family physician and even the specialist realizes the possibility of malignancy and demands esophageal examination with the esophagoscope. The roentgen ray examination for diagnosis of carcinoma of the esophagus cannot be depended upon in the early stages. The direct esophageal examination is the most accurate method of examination for diagnosis and must be used freely in order to make early diagnosis.



Fig. 170—Carcinoma of esophagus involving one third of esophagus with only moderate obstruction.

Once the diagnosis has been made and confirmed by a biopsy, palliative treatment is begun. The object of the palliative treatment is to relieve the obstruction to maintain nutrition and retard the rate of growth of the malignant lesion if possible.

A few patients with carcinoma of the esophagus swallow fairly readily until the time of their death, and in such cases the relief of obstruction is not necessary. However we feel that it is essential to keep the teeth and mouth as clean as possible, freeing the mouth of dental sepsis, to use a bland

no irritating diet and to rinse the esophagus after eating to prevent the accumulation of fermenting material in the lesion

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The patient now has a fair size lumen through which a 7 mm tube can be passed. The wall is entirely smooth and there is no evidence of recurrence. The microscopic section of the lesion showed it to be grade 2 epidermoid carcinoma.

Neuromuscular Conditions—It is to be remembered that any condition which impairs the muscular action of the



Fig. 171—Mr. B. S. M. X-ray showing retained barium meal in the pharynx of the right side.

pharyngeal wall and upper esophagus will have an unfavorable influence on swallowing. Central nervous system lesions such as syringomyelia, amyotrophic lateral sclerosis, syphilis of the central nervous system and arteriosclerotic disease of the central nervous system which affects the bulbar region and the action of the vagus nerves will result in dysphagia. Figure 171 illustrates a case of right vagus paralysis with loss of function of the pharyngeal muscles on the right side and a large accumulation of barium in the right pyriform fossa and the side of the pharynx; also the right recurrent laryngeal nerve was paralyzed in this case.

Case Report—Arteriosclerotic vascular disease with tenth nerve paralysis Mr B S M aged sixty seven years had difficulty in swallowing and hoarseness for three months Examination blood pressure 186 systolic 110 diastolic marked arteriosclerosis paralysis right pharyngeal wall Paralysis right vocal cord x Ray shows filling of the right side of the pharynx and failure to empty the pharynx

In myasthenia gravis difficulty in swallowing is frequently present due to the weakness of the muscles of deglutition The aspiration of food with coughing or choking is a common occurrence Such cases are often markedly improved by ephedrine and glycine During the more difficult periods of dysphagia the passage of a feeding tube to maintain nutrition may help tide the patient over his more serious difficulty

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THE INDICATIONS FOR SURGERY IN PEPTIC ULCER

FRANK H. LAHEY

THE subject of peptic ulcer is gradually emerging from a situation which has been far from satisfactory. While there are many features concerning the subject of peptic ulcer which are still quite unsatisfactory, nevertheless, much progress has been accomplished within the last few years.

It was not so very long ago when medical meetings were enlivened by the bitter debates of those on the one hand advocating the immediate surgical treatment of the patient with peptic ulcer and decrying attempts at nonsurgical cures and on the other hand by those advocating nonoperative measures decrying in turn the end results of surgery and insisting that their advice was constantly being sought for serious digestive difficulties by patients who had been submitted to surgery and who were supposedly surgical cures.

With greater experience, more careful follow up studies and most important of all with tolerant cooperation between gastroenterologists and surgeons, there has emerged an attitude toward gastric and duodenal ulcer which is infinitely more sane than that of the past, greatly superior from the point of view of results accomplished than that of the past and concerned now much more with the true interest of the patient than with the prejudiced support of a personal theory. There is perhaps no field in medicine where the harmonious united efforts of gastroenterologists and surgeons have accomplished more definite results than in that field dealing with gastric and duodenal ulcers.

The indications for surgery in gastric and duodenal ulcer are now quite universally accepted and there are but few points

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The indications for surgery in gastric and duodenal ulcer are now quite universally accepted and there are but few points

about which there is much debate. If a patient has a perforated duodenal or gastric ulcer, obviously the indications for immediate surgery are accepted by everyone. If a patient with particularly a duodenal ulcer fails to be relieved of pain under medical management, then obviously such a patient must either accept the pain or accept some form of surgery. If a patient with a gastric ulcer comes under suspicion for possible malignancy, and the question of malignancy cannot be ruled out, then obviously this patient, provided his condition permits it, immediately becomes a candidate for radical surgery. The two conditions dealing with the indications for surgery in peptic ulcer, in which there is still some disagreement (and because of this, not infrequently unwise delay in a decision) are that of pyloric obstruction, particularly associated with duodenal ulcer, and that of hemorrhage and it is particularly as relates to these two subjects that I wish to speak.

There is no question but that in the past many patients have been immediately submitted to gastro enterostomy because of the fact that during the active stage of their ulcer particularly duodenal ulcer, complete or nearly complete pyloric obstruction occurs. Many of these patients in the past have undoubtedly submitted to gastro enterostomy on the assumption that such pyloric obstruction coming at the time of active duodenal ulcer symptoms was permanent in character when, as a matter of fact such pyloric obstruction could not infrequently by rest, neutralization of gastric acidity and diet, be so relieved that complete and satisfactory gastric emptying could be obtained. It is in this type of patient we believe however, that we have made mistakes occasionally by carrying these patients over too long periods of time under medical management with either unsatisfactory relief of pyloric obstruction or recurring pyloric obstruction. It is in these cases that we believe we might well have applied surgery earlier and with less expense and less time lost to the patient.

Just as in past years we perhaps have applied gastro enterostomy too early in those patients whose pyloric obstruction arising at the height of their ulcer symptoms was due to

pylorospasm and edema so also because of the fact that we have been able to relieve some of these patients with pyloric obstruction by nonmedical measures and so avoid surgery there is a tendency to carry such patients through several recurrences of pyloric obstruction only to ultimately have to submit them either to gastro enterostomy or pyloric resection

As the result of the above experience we feel that if a patient is relieved of pyloric obstruction once only to have it recur again the question of surgery should then be very seriously considered

Hemorrhage in patients with gastric or duodenal ulcer exclusive of perforation is by far the most serious aspect of this condition It is serious not only from the point of view of fatalities as proved by the fact that 5 per cent of all the ulcers in our experience which have bled while in the hospital have died in spite of anything we could do but it is serious also from the point of view that there is a higher percentage of failure under medical measures in those patients who have had a history of hemorrhage before coming to the clinic than in any other group and it is serious from the point of view of the mechanism of its occurrence When a hemorrhage occurs particularly in a patient with duodenal ulcer it is a definite indication that a posterior wall ulcer is eroding into the duodenal and pancreatic tissue and that it is chronic and calloused in character Most duodenal ulcer hemorrhages are the result of erosion of an ulcer into the pancreaticoduodenalis artery running on the posterior wall of the duodenum frequently at some depth from its posterior wall Due to the anatomical arrangement of structures about the posterior wall of the duodenum ulcers in this region tend to become more chronic in character than do those particularly on the anterior wall of the duodenum When an ulcer occurs on the anterior wall of the duodenum it occurs on that portion which is intraperitoneal on a flexible wall with a peritoneal coat in which it is possible for the ulcer to so enfold itself that cicatrization and healing can occur When on the other hand an ulcer occurs on the posterior wall of the duodenum the retroduodenal tissue

about the bed of the ulcer becomes indurated, calloused and scarred, producing conditions not unlike those about a calloused varicose ulcer of the leg. It is mechanically difficult for an ulcer of such character to enfold itself and heal and the fact that hemorrhage has occurred is indicative of the activity and progressive erosion of the ulcer.

It has always been my conviction that both patients and physicians accept bleeding from a peptic ulcer much too lightly. Due to the fact that so many patients with bleeding from a peptic ulcer have had repeated hemorrhages from which they have recovered, due to the fact that the public is so familiar with recoveries from hemorrhage from a peptic ulcer and so relatively unfamiliar with the limited number who succumb from this condition, bleeding from a peptic ulcer has not assumed its true and proper degree of seriousness in the minds of the lay public or the professional world. When one realizes that in our hands and in reports from other hospitals in even higher percentages, 1 in every 20 of the patients bleeding in the hospital has died in spite of anything we can do, it immediately becomes evident that hemorrhage from a peptic ulcer assumes a position of serious importance. Hemorrhage from a bleeding ulcer, when it occurs in spite of good and adequate medical management, immediately demands at least serious consideration of radical surgery—one because of the fact that it evidences progressive advancement in the ulcer itself and two, because associated with any hemorrhage is always the possibility of uncontrollable bleeding and a fatality.

Because of the fact again that most hemorrhages are not of the repeatedly recurring and fatal type, many men not dealing with ulcer patients in large numbers are not acutely aware of the dangers of the fact that there is a type of massive recurring hemorrhage from peptic ulcer which can and does go on quite quickly to a fatality in spite of all measures to offset it. There are two distinct types of hemorrhage in patients with peptic ulcer, that type in which a hemorrhage occurs today perhaps again on the evening of the same day or the next day then ceases and does not recur again perhaps for

several months if ever. There is the massive recurring type of hemorrhage in which large amounts of blood are lost quite suddenly the hemorrhage is repeated again shortly within the same day or within the following day to be followed by further massive hemorrhage and blood loss to such an extent that unless something is done immediately a fatality promptly results.

I have repeatedly stated that there is no situation in surgery demanding a greater background of experience or a finer degree of surgical judgment than in the decision as to when surgery is indicated in the patient with bleeding ulcer. One particularly wishes to avoid surgery in patients with bleeding ulcer for several reasons. There is no time when patients stand surgery less well than immediately following sudden and large amounts of blood loss. It is at this time that any operative procedure results in severe degrees of shock and even operative procedures of moderate magnitude are often followed by fatalities. It is unfortunate also that the character of surgery needed to care for such a situation as a bleeding ulcer is of such a type that it tends to produce considerable degrees of shock. One therefore is in a dilemma in this situation feeling that if surgery is done on these patients when still in good condition and a fatality results in such a patient bleeding might have ceased spontaneously. If one delays until it is evident that a fatality will result unless heroic measures are undertaken surgery performed at this time will not infrequently be followed by a fatality as the result of the poor condition of the patient as the result of the massive hemorrhages.

No standardized rule can be laid down as to when the patient with bleeding ulcer should be operated upon except with the generalization that in the patient who bleeds today and again tomorrow without too great loss of blood and who does not bleed recurrently surgery should not be undertaken until it is proved that the patient cannot be relieved of his ulcer by medical management or until it is proved that the ulcer is still active as indicated by the recurrence of the bleeding. In the patient however who has massive recurrent hemorrhage and in whom a fatality is certain a desperate op-

erative risk must sometimes be taken. In such cases massive drip transfusions in large amounts to prepare the patient and either radical operative procedures in the form of subtotal gastrectomy or temporizing operative procedures in the form of transfixation of the ulcer, may be justifiably undertaken.

The indications for surgery in gastric ulcer have changed considerably within the last few years. It was not so long ago when it was quite universally accepted that one might treat duodenal ulcer by nonoperative measures but that all gastric ulcers, because of the danger of malignancy, were immediately surgical. It is now quite universally known and accepted that the incidence of malignant degeneration in gastric ulcer is probably well under 10 per cent and very probably not over 5 or 6 per cent. There is even a question as to whether or not most lesions presumed to be malignant degeneration in a gastric ulcer, were not primarily malignancies in which secondary ulceration has occurred.

It has now been quite universally accepted that not only is it proper to treat gastric ulcer by nonoperative measures but it has also been accepted that it is not infrequently easier to control the symptoms and to close a gastric ulcer than it is a duodenal ulcer. I have likewise repeatedly stated that if I could be given a period of observation in which to rule out the question of malignancy and I had to have an ulcer I would prefer a gastric ulcer to a duodenal ulcer because of the fact that when healed they heal with better scars and with fewer crippling deformities in the stomach wall to interfere with gastric function.

Following the suggestion of Dr. Sara M. Jordan of the Gastroenterological Department in the Clinic we have for several years as has been frequently described in the literature submitted all patients with gastric ulcer to a period of trial with medical management and when such lesions can be made to disappear as shown by fluoroscopic examination when occult

blood can be made to disappear from the stools and when the patient can be made free from symptoms that ulcer, in our opinion is not in any danger of harboring malignant degeneration and in such a patient surgery may safely be withheld. When in such a patient however these conditions cannot be fulfilled then such a lesion is either an intractable gastric ulcer or in the lesion malignancy is possibly present and in either event radical surgery becomes immediately indicated. This method of segregating the operative from the nonoperative gastric ulcers has been of great value to us and of great satisfaction in that it permits us preoperatively to arrive at a decision as to what should be done with the lesion rather than delaying the decision until the abdomen is opened. This plan acceptably segregates those patients who are operative from those patients who are nonoperative and knowing beforehand what must be done a decision as to whether or not the patient will stand it can be made preoperatively and measures under taken to prepare him as well as possible for a surgical procedure known to be extensive time consuming and dangerous beyond the average degree.

Conclusions—Surgery is immediately indicated in all patients with perforation of a peptic ulcer.

Surgery is indicated in all patients in whom pain persists in spite of a good trial of medical management. Surgery is indicated in all patients with persistent or recurrent pyloric obstruction.

Surgery is indicated in those patients with massive recurrent hemorrhage in which a fatality is threatened.

Surgery is indicated in those patients with peptic ulcer even when symptoms are controlled when recurrent hemorrhage occurs.

Surgery is indicated in those patients with gastric lesions in whom the criteria are present as stated above suggesting that the lesion be either an intractable ulcer or harboring malignancy.

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CARCINOMA OF THE STOMACH AN ANALYSIS OF 291 CASES

SAMUEL F. MARSHALL AND EARL S. TAYLOR

CARCINOMA of the stomach is a common disease and constitutes a high proportion of the gastric cases submitted to surgery. In the Lahey Clinic over a period of ten years (1927-1936) 3 patients out of every 8 requiring surgical management for relief of gastric symptoms had cancer of the stomach, this ratio of gastric carcinoma to ulcer, of course, does not include the unoperated cases. In our series of patients having conclusive evidence of carcinoma of the stomach 41 per cent did not even come to surgery. The stomach is probably the most common organ affected by cancer in the male. Welch in an analysis of a large series of carcinoma occurring in man found that 21.4 per cent were primary in the stomach. Virchow's figures are still higher 34.9 per cent.

We have recently completed a study of 291 cases of carcinoma of the stomach seen over a period of nine years (1928-1936) at the Lahey Clinic. In our series the predominance of males is marked there being 183 males or 63 per cent and 108 females or 37 per cent and this closely approximates other published figures. The United States mortality statistics of 1934 of deaths from carcinoma of the stomach gave males 68 per cent and females 32 per cent. The average age incidence in our series is about fifty-five years; the youngest patient with proved carcinoma of the stomach was nineteen years and the oldest eighty-two years. Table 1 shows the age incidence noted in our series and for comparison the United States census for 1934 for stomach carcinoma is given. It will be noted that only 18 of the 291 cases in our series are less than forty years of age.

The typical symptom complex of a well advanced carcinoma of the stomach with marked weight loss anorexia epigastric distress and often vomiting pallor tarry stools and a palpable mass needs no further elaboration. With this type of picture little or no surgical assistance can be offered and the diagnosis is only of pedantic interest. Detailed examination of the histories and clinical findings of the patients exhibiting vague or early gastric symptoms unfortunately gives no clue to an early diagnostic sign that would bring the patient to operation at a time favorable for cure. It is necessary to make the greatest possible use of all of the signs and symptoms that are available and of the diagnostic aids that are most valuable. Gastric analysis and gastro intestinal series offer the greatest possible assistance.

Symptoms of vague indigestion particularly when there is the slightest suggestion of anorexia or weight loss should always demand a full gastro enterological study. From Table 1 it is seen that the greatest incidence of stomach malignancy is found after the age of forty particularly in males. However this same table also demonstrates that there are a sufficient number of individuals with cancer of the stomach in the younger age group of both sexes so that one can never disregard the possible diagnosis of malignancy on a basis of age or sex. Even with the use of modern improvements in diagnosis brought about by test meals and roentgenology only a small number of patients (1 in 4 of our series) are diagnosed in our clinic—and in much lower percentages in many other reports—sufficiently early to permit a radical operation. It is unfortunately true that the large majority of patients seek aid when the lesion is already inoperable yet there are many who receive treatment for a persistent indigestion until the disease is beyond surgical help. It must be strongly emphasized that the onset of a persistent indigestion in a patient over forty years of age may mean a serious condition and if these symptoms recur or continue under treatment the patient should be thoroughly examined to determine if malignancy is present. Carcinoma tends to reduce gastric acidity and Table

TABLE 1

		0-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
U S Mortality 1934 (26 769 cases)	Cases	61	286	1279	3764	6919	8507	5031	661
	Per cent	0.1	1.0	4.7	14.0	26.2	31.8	18.0	1.4
Series 1928-1936 inc (291 cases)	Cases	1	1	16	59	106	84	22	2
	Per cent.	0.3	0.3	5.3	20.1	36.2	28.7	7.5	0.7

In a previous report of Lahey and Swinton (1935) of 195 cases of gastric carcinoma a tabulation of the outstanding early symptoms which brought the patient to the clinic were given and to this we have added the series of 96 cases seen during the past two years. Table 2 shows the incidence of the earliest symptoms of which the patient was aware. Table 3 gives the frequency of the most commonly elicited symptoms.

CARCINOMA STOMACH—SYMPTOMS 291 CASES

	Table 2 (1928-1934) 195 cases per cent.	Table 3 (1935-1936) 96 cases per cent.
Indigestion	0	92
Anorexia	40	70
Pain	30	70
Vomiting	28	20
Weight loss	25	83
Constipation	7	15
Dysphagia	4	5
Hemorrhage	4	4
Mass	1.5	2
Tarry stool		10
Anemia		10

to the lower gastro intestinal tract. In other words gastro enterological symptoms call for study of the entire gastro intestinal tract if one hopes to avoid serious errors in diagnosis.

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4 shows the overwhelming incidence of achlorhydria in these patients (70 per cent of those tested)

TABLE 4

GASTRIC CARCINOMA FREE HYDROCHLORIC ACID AFTER EWALD TEST MEAL

	Cases
Not recorded	98
No free hydrochloric acid	135
Below 20	32
20 to 40	17
Above 40	9
	<hr/> 291

It will be noted that a large group (98) of this series had no gastric analysis because the symptoms examination and x ray findings were so conclusive that the determination of gastric acidity was unnecessary. It is true that in any large group of patients examined because of gastric distress a number will be found who will have no free hydrochloric acid but in only a fraction of these will cancer of the stomach be found. With evidence of any type of intragastric pathology and with continuance of symptoms while under direct hospital supervision more than passing suspicion should be aroused if there be no free hydrochloric acid following the test meal. By the same token the presence of normal or even excessive amounts of acid does not exclude a diagnosis of carcinoma since 9 of our cases had an acidity over 40.

It is under an inadequately established diagnosis of peptic ulcer that many carcinomas are hidden because unfortunately a number of these patients with gastric distress will show some improvement on a bland diet and alkaline powders with a temporary disappearance of such symptoms as pain and vomiting. Particularly when a gastric ulcer is suspected the patient should be hospitalized and placed upon a strict dietary regime. Frequent stool examinations should be made for occult blood and the remission of symptoms carefully evaluated. The x ray examination should be repeated at intervals and if no improvement in the lesion is noted within three weeks operation must be seriously considered. This is especially true of

prepyloric lesions and those involving the greater curvature, because it has been frequently shown that the latter are almost invariably malignant. Positive evidence of blood in the stools and persistence of original symptoms should add strongly to the decision to operate. The value of this régime and the necessity of rechecking the usually reliable x ray findings is borne out by the following case.

Case I—Mr W L H, aged forty, came to the clinic because of epigastric distress, entered the New England Deaconess Hospital August 24, 1935.

History—Onset of digestive symptoms about two years before admission, with increase in severity of distress during the past year. He had suffered with epigastric distress which came on after meals and at night, relieved by soda, by rest and by belching. Appetite was poor and at no time had he vomited. He had lost 40 pounds in weight. An x ray diagnosis of duodenal ulcer with twenty four hour retention of barium had been made elsewhere six weeks before admission.

Examination—Essentially was negative except for evidence of weight loss and some epigastric tenderness. Gastric analysis three quarters of an hour after an Ewald test meal showed a volume of 100 cc. free acid 58, total acid 67, food content 35 per cent. x Ray examination (Fig 172) showed a dilated stomach. The peristalsis was hyperactive and during fluoroscopic examination no barium was seen to leave the stomach. One hour after the meal no barium had left the stomach.

Treatment—Patient was placed on ulcer management and was partially relieved of his symptoms but gastric lavage showed a persistent gastric retention. With a second x ray examination (Fig 173) ten days later it was difficult to localize the pyloric sphincter but the prepyloric area was considered suspicious. Operation was advised.

Operation performed by S F Marshall. A firm mass 6 cm in diameter was found at the pylorus apparently causing obstruction (Fig 174). A subtotal gastrectomy was done along with a removal of a single enlarged gland. The path



Fig 172

Fig 173

Fig 172—Shows the stomach at first examination the prepyloric area was poorly defined and stomach dilated

Fig 173—The stomach after ten days of medical management the prepyloric area was better defined and showed an organic deformity



Fig 174—Mucinous carcinoma of stomach specimen of resected stomach of Case I The arrow points to an irregular crater in the tumor mass which almost encircled the pylorus

ological diagnosis by Dr Shields Warren was mucinous carcinoma with metastasis to one lymph gland. Convalescence was very uneventful and the patient was discharged from the hospital on the seventeenth postoperative day.

Comment—This case illustrates the value of repeated x ray examinations after treatment. The failure to show improvement under good medical management made the diagnosis of carcinoma distinctly probable. The age of the patient and the high total acidity appeared to indicate a benign ulcer when first seen. This case is also an excellent example of gelatinous or mucinous carcinoma of the stomach. This tumor usually arises in the prepyloric region and quickly infiltrates all coats of the stomach wall. The gastric wall is penetrated early and the original tumor may remain small with early metastases. The gelatinous material infiltrates and gradually replaces all the tissues of the wall of the stomach.

The caliber of the stomach is such that obstructive symptoms seldom arise early and when vomiting and other evidences of obstruction are present the tumor is frequently inoperable. When carcinoma arises near the pylorus stenosis may occur and the frequent scirrhus nature of a growth in this area makes it one of the most favorable for resection. Peptic ulcers not uncommonly cause pyloric obstruction because of edema or pylorospasm but are usually associated with a high gastric acidity and will respond in most instances readily to a good medical regime. A short and steadily progressive history is of considerable importance and demands early surgery. Case report II illustrates obstruction due to a stenosing prepyloric scirrhus cancer.

Case II—J H C aged sixty nine first seen in clinic on February 5 1936

History—Excellent health until two months before admission. Complained of flatulence for five weeks vomiting for a month. Recent diminished appetite and loss of 28 pounds in weight over a period of two months.

Physical examination revealed a well preserved man of

sixty nine years of age Findings essentially negative save for evidence of loss of weight and very slight epigastric tenderness Hemoglobin was 102 and red blood count 4,890 000 Gastric analysis showed the absence of free hydrochloric acid x Ray examination (Fig 175) of the stomach showed an obstructing defect involving the antrum, operation was advised

Operation by Dr S F Marshall A small hard tumor mass (Fig 176) was found in the prepyloric region without evidence of metastasis A subtotal resection was done, and



Fig 175—x Ray shows a filling defect involving the antrum with loss of tone and complete obstruction

patient returned to bed in excellent condition The microscopical diagnosis was scirrhus carcinoma Postoperative course uneventful with discharge from the hospital on six-

primary tumor may be small and large metastatic implants may be found in the liver peritoneum or omentum

When obstruction arises due to the growth being situated at the cardia the patient usually presents himself complaining

of gradually increasing difficulty in swallowing, another symptom which commonly points to a diagnosis of carcinoma. Fortunately, these cases form a small majority of the series because they are the most unfavorable for treatment. These tumors will frequently involve the lower end of the esophagus, the



Fig. 176—Scirrhous carcinoma stomach specimen of resected stomach. The area of induration was 3.5 cm in diameter, was prepyloric and on the greater curvature sufficiently encroached upon the pylorus to cause obstruction.

diaphragm and liver by direct extension and do not lend themselves to resection.

Case III—Mrs. M. F., aged fifty-four, admitted to New England Deaconess Hospital December 18, 1936.

History—Onset of digestive symptoms three months before admission. Complained of epigastric pain following ingestion of food and at times had spit up a little mucus streaked with blood but no true vomiting had ever occurred. Noted some increasing difficulty with swallowing solid foods but no difficulty with liquids, a loss of 30 pounds in weight since onset of illness.

sixty nine years of age Findings essentially negative save for evidence of loss of weight and very slight epigastric tenderness Hemoglobin was 102 and red blood count 4,890,000 Gastric analysis showed the absence of free hydrochloric acid x Ray examination (Fig 175) of the stomach showed an obstructing defect involving the antrum, operation was advised

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FIG. 175—x Ray shows a filling defect involving the antrum with loss of tone and complete obstruction

patient returned to bed in excellent condition The microscopical diagnosis was scirrhus carcinoma Postoperative course uneventful with discharge from the hospital on sixteenth day This case is an excellent example of scirrhus carcinoma in an elderly man with the prominent feature of pyloric stenosis and the absence of ulceration In many cases the primary tumor may be small and large metastatic implants may be found in the liver peritoneum or omentum

When obstruction arises due to the growth being situated at the cardia the patient usually presents himself complaining

quite impossible and gastrostomy was done after the method of Stamm. The patient made an uneventful recovery following the operation and was discharged after the twenty third day receiving all nourishment through the gastrostomy tube. Prognosis of course very poor.

The most common type of onset of carcinoma of the stomach is a slow one and is characterized by mild digestive symptoms or indeed the patient may complain only of loss of energy or fatigue. Gastric symptoms may be mild or not even noted. In our series the most frequent complaint was that of mild indigestion or diminished appetite. Symptoms which would indicate serious disease such as long standing vomiting, great loss of weight, severe epigastric pain occur in a relatively small percentage of patients and in most cases indicated advanced pathology. x Ray investigation is most important and the findings are usually characteristic. Either a well marked filling defect is present or evidence of loss of peristalsis is noted. Of those patients having radiographic examinations a definite diagnosis was possible from the x ray film in 90 per cent of the cases. Table 5 shows the number of cases in which the x ray findings were positive.

TABLE 5

	Pat ents
x -Ray evidence of cancer	242
x -Ray report not available	20
x -Ray inconclusive or error in diagnosis	29
	291 90 per cent positive

Hemorrhage is not a common symptom and occurred in only 4 per cent of our series. This may be gross hemorrhage present in the vomitus or in the stool. However even though gross hemorrhage is not a prominent feature occult blood is persistently found in the stools of almost every patient. Although weight loss was not a common complaint it is of interest to note that a careful history and examination showed that 242 patients or 83 per cent had lost some weight. The average weight loss was 21.8 pounds and a few patients showed

Examination showed evidence of weight loss. Rather marked epigastric tenderness was present but no palpable tumor was felt. Rest of physical examination was not essential. Hemoglobin was 83 per cent. Esophagoscopy revealed a submucosal mass at the lower end of the esophagus just proximal to the gastric mucosa, this mass was firm and showed no ulceration. *x* Ray examination (Figs 177, 178) showed



Fig 177



Fig 178

Figs 177-178—*x* Ray shows filling defect in distal esophagus above dome of diaphragm extending proximally from a large carcinoma of fundus of the stomach.

that the barium was arrested about 3 inches above the dome of the diaphragm. The fundus of the stomach was irregular. A diagnosis of carcinoma of the cardia of the stomach was made and operation was advised.

Operation performed by Dr R. B. Cattell. Upon opening the abdomen the growth was found high in the cardia and had involved the diaphragm and the liver. There were many hard, nodular metastatic masses in the liver. A resection was

Physical examination revealed an elderly man with little evidence of loss of weight but marked pallor. Abdominal examination showed a large firm irregular freely movable mass occupying the entire epigastrium. Gastric analysis revealed no free hydrochloric acid. Upon x ray examination (Fig 179) a constricting lesion of the antrum and of distal half of stomach was noted. Hemoglobin was 45 per cent with a red blood count of 3 280 000.



Fig 180—Adenocarcinoma stomach. Specimen of stomach. Case IV resected at operation. Specimen consists of two thirds of the stomach opened and showing a hard irregular mass completely filling the central portion of its lumen. Margins poorly demarcated and tumor tissue infiltrates adjacent mucosa.

Operation by Dr S F Marshall. A large tumor mass (Fig 180) involving the distal half of the stomach was removed along with a few small glands in the gastrocolic omentum. About two thirds of the stomach was resected and no metastases were noted in the liver peritoneum or omentum. A pathological diagnosis of adenocarcinoma was made by Dr Shields Warren. Convalescence was uninterrupted and the patient was discharged on the twenty third day following operation. A recent x ray examination (Fig 181) made a year after his operation showed the remaining portion to be perfectly

no loss in weight. An occasional one even reported a weight gain.

A palpable tumor is not a frequent finding upon examination and even in advanced cases it may not be felt high under the costal margin. A large abdominal mass naturally carries with it an unfavorable prognosis but operation should not be refused because of this finding alone. An adenocarcinoma may develop locally to a huge growth and yet remain confined to the gastric wall without the occurrence of metastases and still be capable of being resected. In the series of 96 cases studied over the past two years 17 patients had palpable tumors and in 5 of these cases we were able to proceed with a radical resection of the stomach. Case IV illustrates such a case.

Case IV—J. C. male aged sixty six years was admitted to the New England Deaconess Hospital March 25 1936



Fig 179—x Ray shows a constriction lesion of the antral third of stomach. Menstrual signs show distinctly. Stools residue 50 per cent.

History of abdominal distress for three to four months complained of progressive weakness anorexia dizziness. Nausea and vomiting had not been present but had noted occasional sour eructation which was relieved by soda.

lary type which is a soft ulcerating, rounded, vascular tumor and which tends to produce severe hemorrhages, and the diffuse carcinoma which is characterized by an infiltrating tendency and may arise from any part of the mucosa Dr Shields Warren believes that this second form of carcinoma simplex is identical with sclerosing fibrocarcinoma or linitis plastica Early invasion and metastasis occur in both of these forms Case V illustrates a form of carcinoma simplex

Case V—Mr E S, aged fifty, first seen in the clinic on November 1, 1935, because of vague abdominal distress



Fig 182—x Ray of carcinoma stomach (carcinoma simplex) shows a normal cardia and fundus There is a persistent contractural deformity of the distal part of the media and antrum which is irregular in outline and canalized

History—In good health until one month before admission complained of upper abdominal distress occurring two hours after meals accompanied by belching and sour taste in the mouth He had not noted nausea or vomiting and there was no loss of appetite He had lost 12 pounds in weight since the onset of illness

Examination—The general physical findings were essentially negative, weight 170 pounds, no epigastric tenderness

smooth and stomach emptied slowly Patient in excellent health



Fig 181—x Ray reexamination one year postoperative shows a gastrectomized stomach about one third of stomach remaining The remaining portion of stomach is smooth and empties well through stoma

Comment—This case illustrates a large palpable tumor mass in an elderly patient which at first glance would appear to be beyond the operable stage The outstanding symptoms were fatigue and weakness rather than gastric distress Following a serious and extensive operation this patient has regained excellent health

Adenocarcinoma is characterized by a growth which is polypoid or fungoid and frequently ulcerating it may reach large dimensions without invading the lymph glands It is usually near the pylorus rarely arising at the cardia It may originate and develop upon the lesser or greater curvature

Carcinoma simplex comprises the more malignant type of gastric carcinoma and is usually seen in two forms the medul



Fig 183 x Ray shows an annular filling defect occupying the middle two thirds of the media This is constantly narrowed and peristaltic waves are absent from both curvatures



Fig 184—Linatus plastica Specimen consists of whole stomach which is tubular in shape measures 21 cm by 55 cm The wall is thickened up to 7 mm and is leathery in consistency No lymph node involvement A section has been removed from wall for microscopical examination

much narrowed, no peristaltic waves were noted The gastric analysis after an Ewald test meal showed a free acidity of 4 and total acidity of 18

was elicited and no palpable tumor was present. Hemoglobin 90 per cent and red blood count 4 270 000. Gastric analysis showed a free hydrochloric acid of 4 and a total acidity of 58. x Ray examination (Fig 182) revealed a large filling defect in the distal part of the stomach. Operation was advised for carcinoma of the stomach.

Operation by Dr R B Cattell. A large firm tumor mass involving the lower half of the stomach was found with careful exploration revealing no metastatic implants. A high subtotal resection was done without difficulty. A diagnosis of carcinoma simplex with metastases to lymph nodes was made by Dr Shields Warren.

Comment—This case illustrates a relatively symptomless onset with the development of a very large gastric tumor associated with extremely mild symptoms of a month's duration. x Ray examination discloses the pathology readily and diagnosis presents no problem if the examiner heeds the warning of gastric distress in a man of fifty years of age.

Linitis plastica or diffuse fibrocarcinoma is characterized by a diffuse involvement of the stomach with thickening of all the coats and by contraction of the stomach. We have had several cases of linitis plastica and the following case report illustrates such a case upon whom a complete resection was done.

Case VI—Mrs C M G, aged sixty one, was admitted to the clinic November 9, 1936, because of abdominal pains.

History—Indigestion of a year's duration associated with colicky abdominal pain was her chief complaint. A year before admission had had cholecystectomy for gallstones without relief of symptoms. Pain was not related to food but was relieved by heat, pressure or rest in bed. She had lost 12 pounds in weight.

Examination—Physical examination essentially negative. Abdomen flaccid and no mass was felt. Hemoglobin 70 per cent. x Ray examination (Fig 183) showed an annular filling defect occupying the middle two thirds of the media which was

TABLE 6
OPERABILITY RATE 291 CASES

<i>Radical operation</i>	No of cases operated	Operability per cent	Operative mortality per cent
(A) Complete gastrectomy	8	2.7	50
(B) Subtotal gastrectomy	68	23.4	31
Total with radical cases	76	26.1	33
<i>Inoperable</i>			
(A) No operation	88	30.2	
(B) Refused operation	30	10.3	
(C) Exploration only	58	20.0	6
(D) Palliative procedures	39	13.4	40
	291	100.0	

Unfortunately, many of these patients come so late that the lesion has developed beyond any chance of radical removal and the per cent of operability is correspondingly low. Even with large tumors operation should not be refused because the lesion may be capable of removal and at least the patient is entitled to an attempt at relief. This cannot be definitely determined until the abdomen is opened. We refuse operation in only those cases in which definite secondary implantations are demonstrated. This criterion may not hold true in the case of lesions involving the cardia because esophagoscopy or x ray examinations will often determine if the lesion is removable. However we explore some of these cases even though the chance of removal is very low and in a few patients have accomplished worthwhile relief by gastrostomy. While this is not the most desirable procedure it will at least permit an individual to be fed and avoid slow starvation. The finding of implantations in the pouch of Douglas or the presence of a Virchow's node would of course exclude the possibility of surgery being of any value.

At operation we explore the abdominal cavity through an upper left rectus incision examining the omentum the peritoneum and the liver for secondary metastases. The extent of the primary growth in the stomach with local metastases is determined and if the tumor is operable a wide subtotal resec

Operation by Dr F H Lahey A complete gastrectomy was necessary to remove a contracted stomach the walls of which were infiltrated and thickened, the whole stomach (Fig 184) being involved Following the complete resection of the stomach the jejunum was brought anterior to the transverse colon and united to the esophagus Convalescence was slow following operation but completely satisfactory

The occurrence of malignant degeneration in gastric ulcer has long been a debated question and the frequency of its occurrence must be less than 10 per cent Certainly one sees



Fig 185—Papilloma of stomach malignant x Ray shows polypoid filling defect involving lesser and greater curvature of antral third of stomach Note loss of rugae in area involved

cases that suggest origin in a gastric ulcer, but the criteria for establishing such an origin are notoriously unreliable

Papillomata of the stomach are infrequent and like papillomata of the large bowel they are apt to become malignant Stewart found only 56 cases among 12 800 autopsies and 28 per cent of Stewart's cases showed malignant change Figure 185 shows an x ray of such a gastric papilloma and at operation a subtotal gastrectomy was necessary to remove a papilliferous adenocarcinoma

Surgery offers today, the only treatment for cancer of the stomach which is of any value and in our series of 291 cases a radical operation was possible in only 76 cases or 26.1 per cent of the total (Table 6)

results obtained Table 7 shows the follow up results in the 195 cases reported by Lahey and Swinton in 1935

TABLE 7

SURVIVAL FOLLOWING RADICAL OPERATION

(A) Total gastrectomy (3) 4 years 2½ years 1½ years

(B) Subtotal gastrectomy

2 patients 7 years

1 patient 4

1 patient 3½

1 patient 2½

3 patients 18 months

3 patients 17

(C) Palliative operations—average 5 6 months

Laparotomy only 5 4

Inoperable unexplored 7 1

Of the series of 96 cases during the last two years (1935-1936) 26 had radical operation Out of 26, 17 are living There were 6 postoperative deaths and death from recurrence of carcinoma in 3 cases

tion is done. It is important to emphasize that a careful examination should be made to find out whether or not the growth is actually removable before attempting the resection and it is often wise to open the lesser peritoneal cavity through the gastrohepatic omentum in order to determine whether or not the growth has extended to the pancreas or as to whether or not the gland involvement about the celiac axis is too extensive for removal. The extent of the tumor growth upon the lesser curvature should also be determined because the decision for radical operation will often depend upon the amount of esophageal involvement.

Following the division of the gastrocolic and the gastrohepatic omenta the duodenum is divided about 3 cm beyond the pylorus and the distal end inverted and closed. The stomach is then turned to the left and resected widely above the tumor. For the past two years we have employed an antecolic gastrojejunostomy and in most instances we have done a Hoffmeister type of anastomosis. The operative mortality rate in this disease is bound to be high and in our hands has been 33 per cent. We believe this is due to an attempt to remove extensive tumors of the stomach even with local metastasis rather than closing the abdomen in these patients and classifying them as definitely inoperable.

tion even though subtotal gastrectomy is an extensive procedure requires a great deal of technical experience and is accompanied by considerable hazard to the patient. At least at the present time there is no other form of treatment and operation for this lesion should be advised early. Certainly carcinoma of the stomach unoperated upon progresses inexorably to a fatal outcome with many weeks of suffering before death intervenes. As emphasized above what is most needed in the treatment of carcinoma of the stomach is earlier diagnosis and it is only through this that operability will be increased and with it correspondingly better postoperative

FACTORS INFLUENCING THE SURGICAL RELIEF AND CURE OF CARCINOMA OF THE STOMACH

EVERETT D. KILFER

ON the walls of the postmortem room of the Palmer Memorial Hospital is the inscription *mortui vivos docent* a reminder that much of what is now known of carcinoma of the stomach has been learned at the autopsy table from patients dead of this disease. However in nearly every reported series of cases there are a few truly a depressingly small number of patients who by means of radical surgery have been able to escape the usual grim outcome of cancer of the stomach or at least have enjoyed a few years of comfortable life after their more unfortunate fellow victims have died. It would seem that this small outstanding group of cases has a message for the student of this disease and that the living also teach the living.

From the records of this clinic 16 cases of carcinoma of the stomach have been selected for special study because they represent patients who following radical resection of the diseased portion of the stomach have lived comfortably for at least a year without evidence of recurrence of malignant disease. This group does not represent the complete experience of the clinic in this respect but consists of patients whose records were readily available.

There was one case who was alive and well nine years after operation another who did not show evidence of recurrence until six years had passed another who lived three years without recurrence 3 others who were alive and well after three years 1 showed a recurrence in the second year and there were 9 who were in their second year without yet developing signs of a recurrence.

ANESTHESIA FOR GASTRO-INTESTINAL SURGERY

LINCOLN F SISE

ANESTHESIA for gastro-intestinal surgery must fulfil some very exacting demands, since it should give the surgeon advantage of the favorable operating conditions which come from extreme muscular relaxation, and at the same time should upset the patient as little as possible. Many of these operations, such as resection of various portions of the large bowel or of the stomach are among the most serious in surgery. Here the mortality from surgical causes may be distinctly affected by the operating conditions. Working with complete muscular relaxation and a quiet abdomen the surgeon can do better work and thus obtain better results than if hampered by muscular tone in the abdominal wall and by motion of the abdominal contents. This point is of the utmost importance since the chief variation in mortality will come from surgical rather than from anesthetic causes. The mortality from surgical causes is so much higher than that from anesthetic causes that a given percentage reduction in the former will do much more than outweigh the same percentage increase in the latter. Thus, we cannot decide on the best and safest anesthetic for one of these procedures from a consideration of the anesthesia alone but must take into account the whole procedure and course of events included in operation, anesthesia and recovery.

The relative importance of these three portions will vary according to the operation, the patient and the surgeon. With a difficult operation such as resection of the stomach which carries a comparatively high mortality from surgical causes, unless the patient is in decidedly poor condition the surgeon should receive the benefit of the very best operating conditions possible. The raising of the possible anesthetic mortality by a fraction of 1 per cent in obtaining these conditions is of little

concept receives some support from the somewhat lower incidence of anemia (25 per cent with a hemoglobin less than 70 per cent) in the relieved group as compared to 40 per cent in the unrelieved group. Fifty per cent of the relieved cases had achlorhydria while 74 per cent of the unrelieved cases showed this condition, a comparison which also suggests longer duration of disease in the latter group. A palpable mass was found in 38 per cent of the first group and in 46 per cent of the latter group. The higher incidence of lesions in the lower end of the stomach found in the relieved group tends to increase the number of palpable tumors, but this fact emphasizes that the presence of an abdominal mass does not preclude the operability of the lesion.

Undoubtedly there are many other factors influencing the duration of the preclinical stage of cancer of the stomach among which are variations in the characteristics of the tumor such as the rate of growth and the tendency to metastasize, variations in the individual resistance to malignant disease and variation in the sensitiveness of the patient which makes him aware of the fact that something is wrong with his digestive apparatus.

It is obvious that for the present, progress in the treatment of gastric carcinoma must be toward reducing the time between the onset of the first symptom and the time when the patient is operated upon. This calls for education of the public and of the medical profession regarding the recognition and significance of early symptoms of cancer and the value of x ray examinations for apparently insignificant digestive disturbances. Medical service will have to be so organized that x ray examinations will be readily made by roentgenologists who are competent to detect minimal lesions of the stomach and that operations can be done without delay by surgeons who are competent to carry out radical resections of the stomach without a prohibitive mortality.

weak patient. Nevertheless it has not seemed to us that we have been troubled by having spinal anesthesia increase or produce shock. In fact the situation is rather the reverse. We are at a loss to know what other anesthesia we could use which would produce as little. Because of the recent improvements in spinal anesthesia we now have a strong tendency to use it with some patients on whom a few years ago we would have used some of the other forms of anesthesia to be discussed shortly. Present day spinal anesthesia is so much better than it was a few years ago that our present tendency is to widen its use to include some of the poorer risks rather than to restrict it further.

3 The most serious drawback to spinal anesthesia is the possibility of neurologic complications. The most damaging report on this score has been that of Brock and others.¹ The bare possibility of results such as those described make one pause. However a consideration of the whole field of spinal anesthesia shows that any such results are exceedingly rare. In our own series of over 6000 cases we know of no case having any permanent damage result and analysis of the 5 cases of residual paralysis reported by Brock shows that in only 1 case was the technic and care such that no exception could be taken and this 1 case appeared to be one of special sensitization to the drug. This still further emphasizes the extreme rarity of these complications when the anesthesia has been administered by a man of wide experience.

On the whole then the possibility of nervous sequelae appears to be a very real drawback to spinal anesthesia but the extreme rarity of these cases when careful technic is used makes them of minor consequence to the field as a whole though they might be of very great importance in an individual case.

While spinal anesthesia gives the best possible operating conditions for the difficult operations it also gives the patient an extremely good recovery. This is logical since this anesthesia is in reality a form of regional anesthesia and one in which relatively an extremely small dose of the drug suffices. In a careful survey which we made of postoperative recovery

consequence compared with the possible benefit of lowering the surgical mortality by 1 or 2 or possibly even 5 or 10 per cent. Here the more important point is to facilitate the surgery and thus safety of anesthesia should give way to safety of surgery since this is the more important of the two. With a procedure like gastrostomy however the reverse is true. Here the surgical procedure is relatively simple and easy but the condition of the patient is usually poor due to starvation so the important point here is to choose an anesthetic which will upset the patient as little as possible even though operating conditions are not good.

Without any question spinal anesthesia produces the best abdominal operating conditions of any anesthesia in general use today. This is conceded even by those who for other reasons oppose its use. It is therefore the anesthesia of choice for all operations of technical difficulty on the gastro intestinal tract such as resection or for operations where soiling may take place such as acute appendicitis.

Spinal anesthesia has been the subject of much controversy and is opposed by many because of (1) danger of immediate death (2) possibility of increasing the patient's susceptibility to shock and (3) neurologic sequelae.

1 The danger of immediate death depends more on the experience and skill of the administrator than on the method. Undoubtedly there is some danger if the administrator is not well skilled and experienced but with a competent anesthetist who is using modern methods the danger is so remote that it is negligible in comparison with the benefits.

2 There is more reason to fear that operative shock may be intensified by the vascular depression of spinal anesthesia. In some patients these two factors may so depress the blood

anesthesia is most suitable for the strong and muscular type of patient who is difficult to relax and is not so suitable for the

give time for a gastric resection, yet the comfortable margin of time allowed by nupercaine is preferable

The dosage of pontocaine must be varied considerably, not only in accordance with the length of the proposed operation, but also in accordance with the condition of the patient. We have rarely found it necessary to use the full 20 mg contained in an ampule of the drug, but we have often used 10 or even 9 mg for complete abdominal anesthesia, and have found that in weakened individuals this will give over one hour's anesthesia. These small doses by this method have proved very satisfactory with elderly and weakened individuals in operations for intestinal obstruction. In a vigorous young adult, however, 10 mg of the drug would probably not give anesthesia sufficient for an appendix operation.

In resections of the large bowel in patients in reasonably good condition, 14 to 18 mg is usually suitable. In appendix operations in the young and vigorous 14 to 16 mg is used. This gives ample coverage for the operation, and while more of the drug may be given than is actually needed, yet to the vigorous patient it does no harm.

This is a point which needs to be stressed. With vigorous patients the size of the dose should be sufficient to cover the estimated time of operation and leave time to spare over and above this. These patients are resistant to the effects of the drug. The anesthesia is comparatively short, and the depressive effects are slight or absent. Thus a comparatively large dose is needed, and is well tolerated. With individuals weakened either by age or disease just the reverse is true. A small dose produces a comparatively long anesthesia and the patient is susceptible to depressing effects unless the dose is kept at a minimum.

Nupercaine 1 1500 according to the technic of Howard Jones² has given the most satisfactory spinal anesthesia of which we have had experience, in that the anesthesia is long enough to cover any operation and the depressive effects are remarkably slight. The induction period, however, has proved so long and cumbersome that we have reserved this method for

in 100 consecutive cases we found that after nitrous oxide ethylene and cyclopropane administration (all extra abdominal), vomiting occurred at least once in 87 per cent of the cases. After spinal anesthesia however, vomiting occurred in only 25 per cent after the abdominal operations, and not at all after extra abdominal operations. The difference in this respect between the general anesthesia and spinal anesthesia is most striking.

Thus, spinal anesthesia appears to us to be very desirable not only because it facilitates surgery in this type of operation but also because it causes less general disturbance to the patient and less postoperative upset than some other forms of anesthesia commonly employed.

In recent years two new drugs, pontocaine and nupercaine have been introduced which have greatly improved the results in spinal anesthesia. These drugs have two important advantages over those in previous use: (1) they produce less vascular depression; (2) they give a longer anesthesia.

With pontocaine we use a technic which has been described elsewhere in this publication³ by means of which the anesthetic solution is weighted with glucose and run into position by means of gravity. This gives a quite dependable anesthesia which is under a large measure of control. It is quite suitable for operations in the level position but is not quite so good when the Trendelenburg position must be used early in the operation. With good judgment of the proper dosage it will give anesthesia of two hours, usually somewhat more if desired. It is therefore very suitable for appendix operations as well as for operations on the small bowel, cecum, transverse and descending colon and usually on the sigmoid. Though it is not quite so convenient for use on the rectum because of the frequent use of Trendelenburg position early in the operation, we have used it in many of these cases with satisfaction. It will give time for resection in these regions unless distinct error is made in judgment of proper dosage. With appropriate dosage it is quite suitable for ileostomy (though field block is often enough) or gastro-enterostomy and though it will usually

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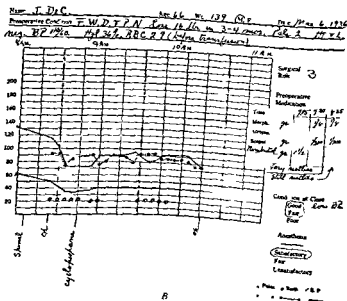
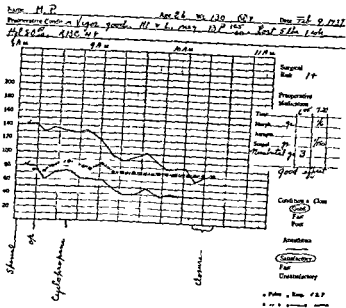


Fig 186.—The course during operation of the two patients reported in Dr Marshall's article on page 705. Each had pinal anesthesia with eupercaine anesthesia also, 4, for the relief of retching and B for restlessness. In both cases, though blood pressure sagged considerably, pulse remained very steady.

those cases where it seems particularly indicated, using the pontocaine glucose technic for all others. The chief procedure for which we have used nupercaine has been for stomach resections. For this purpose it seems ideal. For this difficult, dangerous and time consuming operation the surgeon is given operating conditions so favorable that they cannot be equaled or even approached in any other way. The depressive effects

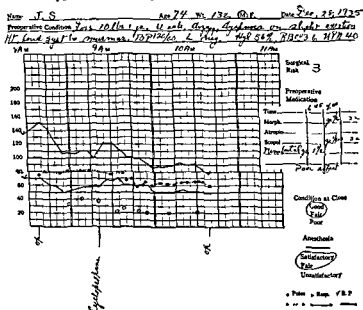
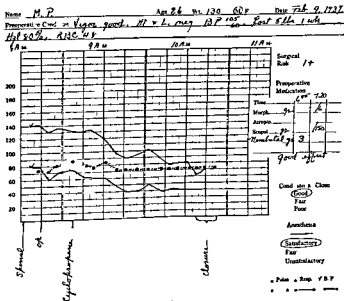


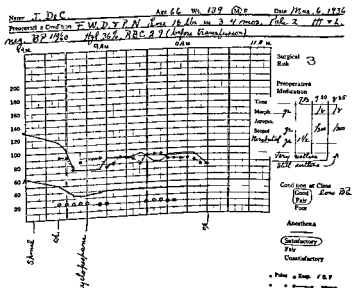
Fig 187—Course during operation of another gastric resection in a patient who was an especially poor risk. Course much the same as other two. Cyclopropane again necessary for retching. Recovery uneventful with prompt return home but with death six months later from his original disease of carcinoma.

are remarkably slight when one considers the severity of the operation and the extreme and widespread muscular relaxation present. Recovery is excellent.

Attention is called to the article by Dr. Marshall elsewhere in this issue showing the recovery period of some of these cases. In the illustration (Fig. 186) is shown the course of these 2 cases during anesthesia. In Fig. 187 is shown the course of



A



B

Fig 186—The course during operation of the two patients reported in the above article on page 705. Each had spinal anesthesia with nupercaine.

produces its inevitable effects. There is a fall in blood pressure accompanied by a change in pulse rate which is sometimes upward and sometimes downward. There is commonly retching or vomiting. Spinal anesthesia alone and by itself probably causes retching and vomiting only rarely. These effects are usually caused by the manipulations of the surgeon. After short periods all these reflex effects are rapidly relieved when traction is discontinued but if traction has been long maintained recovery may be slow. Vigorous surgical manipulation may cause still further effects which in a few instances may even present a picture similar to that of an athlete who has had his wind knocked out during a game of football. The pulse and blood pressure become very weak or disappear entirely. The face becomes pallid and breaks into sweat and the patient complains of a smothering sensation and inability to breathe.

It therefore behooves the surgeon if he is to bring his patient through in as good condition as possible not to rely on any blocking action of spinal anesthesia but to be as gentle as if he were working under local anesthesia and especially to avoid traction on mesenteric attachments.

Spinal anesthesia however requires the services of one experienced and well skilled in its use. Without such a person it would be dangerous to attempt spinal anesthesia for any major procedure especially for such a one as gastric resection where a very high and long anesthesia is necessary.

When no such person is available it is well to remember that ether produces a very good anesthesia and that some familiarity with its use is widespread. Though it may be given by the tyro without great immediate danger the results of a skilful administration are far superior both during operation and in the postoperative period. Given in this way it produces excellent relaxation and a comparatively good recovery though neither the operative conditions nor the recovery can compare with those from spinal anesthesia. It should not be given however if there is marked impairment of liver or kidney function.

another patient who was an especially poor risk but whose course was much the same as the other two, and who made a good recovery

The final test of anesthesia is the recovery period. While many factors are involved in this of which anesthesia is not the most important, yet anesthesia is among those of some importance and cases such as these tend strongly to show that this factor must be quite suitable to allow so favorable a result.

It is well in passing to mention epidural anesthesia though our personal experience with this method is as yet so slight that we forbear to express any opinion. This method appears to produce the excellent operative conditions of spinal anesthesia but without the danger of nervous complications. This would be a marked advantage since the possibility of nervous complications is now the greatest single drawback to spinal anesthesia. Epidural anesthesia has the disadvantage in a busy clinic that the induction period is considerably longer than with spinal anesthesia and that the length of anesthesia may not be sufficient.

The other division of these operations in which nupercaine spinal anesthesia has proved useful is in some operations for carcinoma of the rectum in which the Trendelenburg position is assumed early. Since nupercaine solution is lighter than the spinal fluid it has here been more suitable than the heavy pontocaine glucose solution. In resections of the rectum or sigmoid it has been used also particularly where the patient is an especially poor risk since the depressive effects with nupercaine have appeared to be less where a very prolonged anesthesia was necessary than with pontocaine.

Some men have had the idea that spinal anesthesia interposed a block between the operating field and the brain which prevented the reception of depressing or shocking impulses from the field of operation. Clinically this is far from being the case. Reflex effects are recorded with remarkable fidelity on the chart of the anesthetist. One familiar with the operation can tell from the anesthesia chart alone what the surgeon is doing. Particularly traction on mesenteric attachments

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foration in any part of the tract or in operations for obstruction, a somewhat deeper gas anesthesia is usually needed, sometimes with the additional use of various amounts of ether. Here it is of great benefit to use the intratracheal method. These patients may usually be intubed easily, and the results are sufficiently improved to justify the slight extra strain on the patient. The patient has much less tendency to strain so that the practical effect is that of greater muscular relaxation. In addition and of considerable importance the possibility of laryngeal spasm with resulting anoxemia is eliminated. If the surgeon in his manipulations elicits a sensitive abdominal reflex when the patient is not very deep a laryngeal spasm with complete obstruction to respiration may very likely result when the intratracheal method is not being used. The anesthetist is then powerless to do anything. He must wait until the spasm relaxes before he can give either oxygen to combat the anoxemia or more gas to deepen the anesthesia. Meanwhile the anoxemia may progress to a point which in these weakened patients may be acutely dangerous. To eliminate entirely the possibility of such an occurrence as this and by so simple a procedure as intubation is well worth while.

For this small group of patients then who are in too poor condition to make the use of spinal anesthesia expedient abdominal field block or this block combined with general anesthesia may be used to good effect. One of the great advantages of these combinations is their extreme flexibility since results may be obtained which vary widely with the various combinations and with the emphasis which is placed on various parts of the combination and yet which may be adjusted with great nicety to the individual needs of the particular occasion. Some of these combinations are in wide use by all anesthetists. Here the judgment and skill of the anesthetist has full play in choosing the combination appropriate to the given case and in adjusting the level of anesthesia to suit the needs of the moment.

Summary—Many operations on the gastro intestinal tract are of technical difficulty and some carry a high mortality, and in these cases the splendid operating conditions produced

Though spinal anesthesia is suitable for the overwhelming majority of operations on the gastro intestinal tract, there are a few cases in such poor condition at the time of operation that they should not be subjected to the depressing influences of this anesthesia especially if the operation is not one of technical difficulty. In our experience the number of these cases has become steadily less as improvements have taken place in spinal anesthesia and its applicability has therefore become widened to include an increasing number of this group.

There do still remain, however, a few cases in which it seems wiser not to use spinal anesthesia. Such cases will be found most often among those having the operation of ileostomy or gastrostomy or in elderly individuals in whom a perforation of some portion of the tract has caused a condition of severe shock.

In ileostomy or gastrostomy abdominal field block will usually be sufficient, sometimes with the addition of light cyclopropane anesthesia. The breathing under cyclopropane is very quiet and this quietness is still further enhanced by the carbon dioxide absorption method usually employed with this gas. There is no anoxemia since abundant oxygen can be used with it, and some slight degree of relaxation is produced. The after-effects vary considerably with the depth employed during operation. There is a tendency to nausea and some general upset if much depth is employed but if only a light degree of anesthesia is used recovery is extremely good. It is therefore well not to push the drug in order to obtain relaxation for it is much better to rely on the field block for relaxation and to produce with cyclopropane only such depth as is necessary in addition to field block for the progress of the operation.

Field block is easily accomplished by infiltrating with 1/2 per cent novocain or better still metycaine the appropriate layer of the abdominal wall on the side from which come the nerves supplying the region of the incision. This gives anesthesia and muscular relaxation of a limited area supplied by the nerves which have been blocked.

When the operation is not so localized and a wider area of the abdomen must be explored as in operations for acute per

THE PLACE OF THE BILLROTH I OPERATION IN SUBTOTAL GASTRECTOMY

RICHARD B CATTELL AND BENTLEY P COLCOCK

THE Billroth I type of anastomosis or end to end gastro duodenostomy in subtotal gastrectomy is infrequently used yet it can be employed to advantage in suitable cases. Due to the fact that in lesions requiring resection of the stomach a large portion must be removed to attain the desired result, in many cases it becomes difficult to approximate the cut end of the stomach to the duodenal stump. We wish to call attention to the advantages and disadvantages of this operative procedure and present cases in which it has been employed as the operation of choice.

In the past two years we have performed the Billroth I operation in 9 patients while in the same period 71 resections of the stomach have been done utilizing the Hoffmeister modification of the Polya type of anastomosis.

The type of operation to be used cannot be decided upon until abdominal exploration has been carried out. If the lesion is considered operable and the limits of a desirable resection determined (Fig 188) the adaptability of the Billroth I operation can be fairly well judged. The attachments of the gastroduodenal and gastrophrenic omentum are divided (Fig 189), ligating the left gastric artery high on the lesser curvature and the duodenum freed. The duodenum can be divided between clamps and the stomach turned upward. Application of the dePetz sewing clamp across the stomach (Fig 189) is done and the portion to be resected is removed. At this time the remaining portion of the stomach can be drawn down to the duodenal stump (Fig 190), and it can be accurately deter-

by spinal anesthesia should improve operating results and lower the final mortality

Pontocaine and nupercaine will give anesthesia of sufficient length for any operation, and with less depression than when novocain is used

With very poor risk patients and with the simpler operations various combinations of abdominal field block with gas and ether anesthesia, often by the intratracheal method offer an anesthesia of great flexibility suitable for a wide variety of conditions

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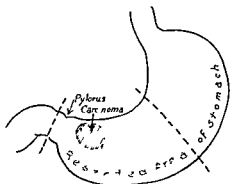


Fig 188—A diagrammatic sketch indicating the favorable limits for subtotal gastrectomy with the Billroth I type of anastomosis

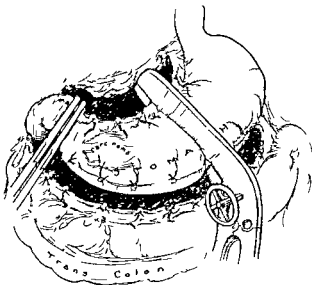


Fig 189—The attachments of the gastrohepatic and gastrocolic ligaments have been divided ligating the left gastric artery in a high position. Clamps have been placed across the delivered duodenum and a dePesz sewing clamp is placed on the stomach at the upper limit of the resection.

mined whether the end-to-end anastomosis of the stomach to the duodenum (Figs 191, 192) is safe and feasible. It will

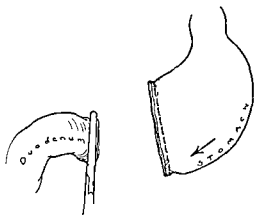


Fig 190—The resected portion of the stomach has been removed. The silver clips prevent leakage from the gastric segment. The gastric portion can be displaced to the right as indicated by the arrow and the feasibility of the anastomosis accurately determined.

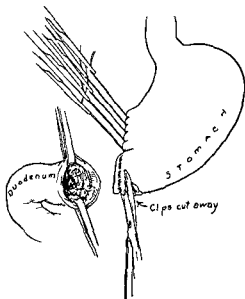


Fig 191—The lesser curvature side of the stomach has been inverted and the clips on the greater curvature side are then cut away. In carrying out the end to end suture the posterior suture line is placed with both stomach and duodenal ends still closed.

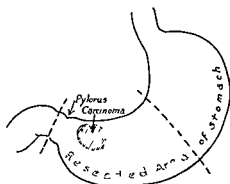


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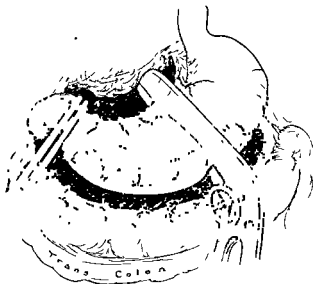


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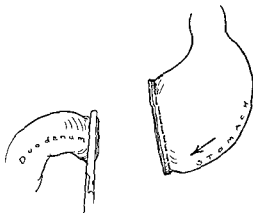


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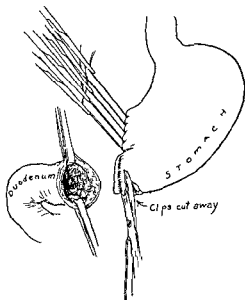


Fig 191—The lesser curvature side of the stomach has been inverted and the clips on the greater curvature side are then cut away. In carrying out the end to-end suture the posterior suture line is placed with both stomach and duodenal ends still closed.

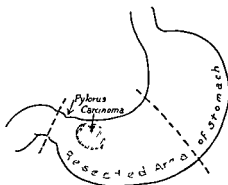
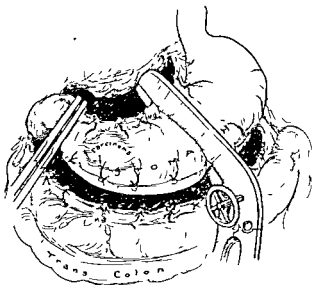


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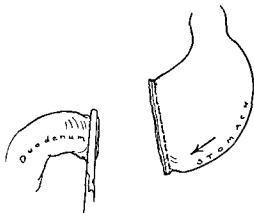


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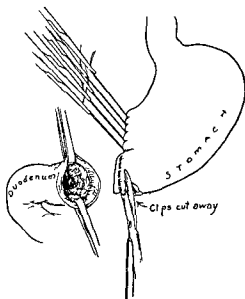


Fig 191—The lesser curvature side of the stomach has been inverted and the clips on the greater curvature side are then cut away. In carrying out the end-to-end suture the posterior suture line is placed with both stomach and duodenal ends still closed.

will have too great a tension or that technical difficulties will arise in doing the anastomosis of this type to the duodenum the duodenal stump can be closed and the more usual Polya type of anastomosis or gastrojejunostomy employed

If the Billroth I type of anastomosis is definitely decided upon only with these favorable circumstances and at this point

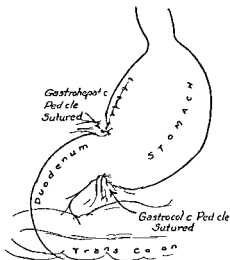


Fig 192—The gastroduodenal suture is shown completed with the gastrohepatic and gastrocolic pedicles anchored at each angle

during a resection it should yield good results. It is important not to decide upon the type of anastomosis until after the stomach has been resected to the extent demanded by the type and extent of the lesion present. It should by no means be a factor in limiting the extent of the resection.

There are a number of advantages to the Billroth I type of operation. After exploration of the abdomen and the local field the initial exposure of the stomach and duodenum is

maintained throughout the operation since it is unnecessary to deal further with the jejunum or transverse mesocolon after the stomach attachments are freed. Likewise the extent of the peritoneal cavity that may be soiled by gastric and duodenal contents is limited to this same area by the moist gauze pads that are placed at the beginning of the operation and only removed before closing the abdomen. The time required for carrying out subtotal gastrectomy by this plan is considerably less than that required for the Polya type. One of the most time consuming parts of the usual subtotal gastrectomy is closure of the duodenal stump. With direct gastroduodenotomy utilizing the sewing clamp the operation can be completed reasonably in one and one quarter to one and one half hours unless unusual complications are encountered. Finally the nearest approach to the restoration of the normal anatomical (Fig 192) and physiological conditions are obtained by the Billroth I type of anastomosis. The gastric contents pass directly into the duodenum and even with a considerable portion of the acid secreting area of the stomach remaining they are best tolerated with gastroduodenal continuity. While no sphincteric action remains with removal of the pylorus with the resection it does not result in the dumping of gastric contents too rapidly into the small intestine which may result following the Polya operation.

From a consideration of these advantages it will be seen that the Billroth I operation is particularly well adapted to the prepyloric (Fig 188) malignant lesion or carcinoma involving less than one half of the corpus of the stomach. Even if the surgeon does not like this operation it must be admitted that it might well be the operation of choice in the elderly or poor risk patient where the hazards of the operation might well be in direct relation to the length of operation, shock and wide spread soiling. The operation cannot be widely employed where subtotal gastrectomy has been selected for the intractable gastric or duodenal ulcer. However in poor risk patients with low gastric acid with gastric ulcer it can be employed to advantage.

thus be seen that the surgeon is not committed to carry out the Billroth I plan until he can be certain that this is a reasonable procedure. If at this time it is thought that the suture line will have too great a tension or that technical difficulties will arise in doing the anastomosis of this type to the duodenum, the duodenal stump can be closed, and the more usual Polya type of anastomosis or gastrojejunostomy employed.

If the Billroth I type of anastomosis is definitely decided upon only with these favorable circumstances and at this point

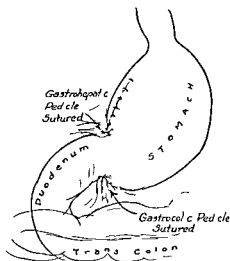


Fig 192—The gastroduodenal suture is shown completed with the gastroduodenal and gastroduodenal pedicles anchored at each angle

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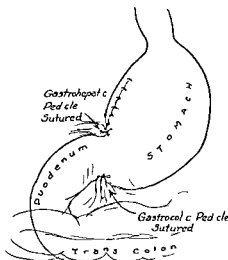


Fig. 192.—The gastroduodenal suture is shown completed with the gastrohepatic and gastrocolic pedicles anchored at each angle.

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For the past six weeks he had had 4 to 6 movements a day with bright red blood mixed with the stool. During this time he had also had some nausea, and a gnawing burning epigastric pain relieved by food. In addition, during the past four years, he had had *two definite attacks of coronary occlusion*, each requiring three to five weeks in bed. Nocturia was his only other complaint. Physical examination revealed a moderately enlarged heart with distant sounds, slight epigastric tenderness and no palpable masses. A diagnosis of carcinoma of the stomach with coronary arterial disease was made.



Fig 193—Case I. The filling defect of a localized prepyloric carcinoma of the stomach is shown.

A gastric analysis showed no free acid, a total acid of 15, with fresh blood present. Hemoglobin was 78 per cent, red blood cells were 4 820 000, white blood cells 4400, nonprotein nitrogen 33 mg, bilirubin 0.4 mg. A gastro intestinal series showed a filling defect in the antrum just proximal to the pylorus (Fig 193) with interruption of peristalsis at this point. A barium enema was negative.

On August 23, 1935, a resection of the growth was performed (operation by Dr. Richard B. Cattell), removing about two thirds of the stomach (Fig 194), with a Billroth I anas-

The disadvantages of the Billroth I operation are better known than the advantages and this has resulted in a too limited use of this procedure. It should be stated at once that it is not applicable to intractable duodenal ulcer for two essential reasons. First they are usually on the posterior wall are markedly adherent and difficult to free up. When it is possible to resect the ulcer itself a short duodenal stump remains making a direct gastroduodenal suture difficult. In some cases it is necessary to leave a deep penetrating ulcer *in situ* because of too great risk in resecting it and in these cases it is unwise to have the gastric contents pass over the ulcer. Second these intractable duodenal ulcers usually have an associated hyperchlorhydria and the more limited resection of the Billroth I type is inadvisable because it does not accomplish satisfactory reduction of the gastric acidity.

Likewise the Billroth I operation is not feasible for extensive malignant gastric lesions. In these a radical and wide resection must be the primary consideration while the method of restoring gastrointestinal continuity should be secondary. There are in addition certain technical disadvantages to this operation. With closure of the stomach on the lesser curvature side and end to end anastomosis of the duodenum and stomach on the greater curvature side the upper angle of the suture line or the triangle of death may be a potential point for leakage of gastric contents. This danger point is present where the anterior and posterior suture lines meet the suture line of the closed end of the stomach. After mobilizing an adherent duodenum the wall may be found to be thin and not suitable for suture to the thicker gastric wall although the stump may be readily closed and inverted.

With this consideration of the advantages and disadvantages of the Billroth I operation we will present the case reports of the patients in whom it has been employed in the past two years in this clinic.

Case I—J J McG a seventy five year old white male was seen at the clinic August 16 1935 complaining of diarrhea

and was discharged nineteen days after operation in good condition with the wound well healed

This patient was seen one year after operation at which time he felt very well, had no digestive symptoms was active worked in his garden and mowed the lawn regularly x Ray examination at that time (Fig 196) showed a stomach about one third normal size smooth and symmetrical in outline with no evidence of recurrence At the time of his last examina



Fig 196—Case I One year after operation barium meal Note the normal emptying into the duodenum and size of the remaining stomach

tion March 29 1937 his condition was found satisfactory except for internal hemorrhoids

Case II—R McC a sixty seven year old white male, was seen at the clinic July 29 1936 complaining of pain in his right abdomen This pain had occurred three to four times a day for the last two months was located just to the right of the umbilicus and was sometimes helped sometimes aggravated by food There had been no change in appetite, but he had slight nausea and flatulence Physical examination was



Fig 194—Case I Note the large segment of stomach representing approximately two thirds that has been resected with the Billroth I type of anastomosis



Fig 195—Case I Photograph of the opened stomach showing the localized carcinoma in the prepyloric area with a deep central crater

tomosis The microscopic diagnosis on the specimen (Fig 195) removed at operation was adenocarcinoma with negative lymph nodes The patient had an uneventful convalescence,

This patient was seen seven months after his operation, at which time he felt fine, had no indigestion, gastric analysis showed no free acid, a total acid of 10. A barium meal showed



Fig 198—Case II The postoperative examination of the stomach seven months after operation. Approximately one half of the stomach remains with normal emptying.

a stomach about one half normal size (Fig 198), emptying at a normal rate, through a smooth stoma.

Case III—M. N., a fifty year old white female, was seen at the clinic September 30, 1935 complaining of nausea and vomiting. These symptoms had been present for the last four months, had no definite relationship to food, and were rarely accompanied by pain. She had lost 40 pounds in weight during this time. She remembered having some stomach trouble twenty five years previously. Physical examination showed some abdominal distention, tenderness in the right lower quadrant, but no masses.

A gastric analysis showed a free acid of 48, total acid of 66, with a 4 plus test for blood. Hemoglobin was 70 per cent, red blood cells 4,320,000, white blood cells 6900, nonprotein

negative except for slight midabdominal tenderness, and an enlarged prostate

Gastric analysis showed a free acid of 76, with a total acid of 85 Hemoglobin was 98 per cent, red blood cells 4,700 000, white blood cells 7500, nonprotein nitrogen 37 mg, bilirubin 0.2 mg A barium enema was negative except for a marked area of spasm in the transverse colon Barium by mouth



Fig 197—Case II Preoperative stomach x ray interpreted as showing a defect on the greater curvature side in the prepyloric area There is a similar area on the lesser curvature side Examination of the specimen showed this to be a peptic ulcer on the lesser curvature

showed a filling defect on the greater curvature of the stomach (Fig 197), just proximal to the pylorus

On August 17, 1936 a resection of the stomach was performed (operation by Dr Richard B Cattell) removing one half of the stomach, utilizing a Billroth I type of anastomosis The specimen removed at operation showed an ulcer on the lesser curvature, the microscopic diagnosis on which was peptic ulcer He had an uneventful convalescence and was discharged on his sixteenth postoperative day in good condition

had been present for the last five months. It usually disappeared in a few hours, and was *seldom accompanied by vomiting*. His appetite had been growing less, and he stated that his stomach filled up much more quickly than formerly. During the last few weeks he had felt quite weak. Physical examination was essentially negative except for malnutrition.



Fig. 200.—Case IV. A long prepyloric filling defect is shown with the faint outline of barium on each curvature. This was proved to be carcinoma of the stomach without lymph node involvement.

Gastric analysis showed no free acid, a total acid of 28 and a 3 plus test for blood. Hemoglobin was 85 per cent, red blood cells 4,070,000, white blood cells 10,020. A barium meal showed a filling defect in the antrum (Fig. 200), with very little retention in four hours. A barium enema was negative.

At operation by Dr. Richard B. Cattell on May 7, 1936, a malignant lesion was found in the antrum of the stomach, and this was resected together with adjacent lymph nodes (Billroth I). About 80 per cent of the stomach was removed.

nitrogen 25 mg bilirubin 0.2 mg x Ray examination showed a dilated stomach with 100 per cent retention of the barium in six hours (Fig 199)

At operation by Dr Richard B Cattell on October 23 1935 an obstructing duodenal ulcer and a diverticulum of the duodenum were found These were excised removing over one half of the stomach with a Billroth I type of anastomosis The



FIG. 199—Case III This gastric film shows a dilated stomach with approximately 100 per cent residue in six hours. Resection was done because of an associated diverticulum in the first portion of the duodenum.

microscopic report was healed peptic ulcer of the duodenum. She had an uneventful convalescence and was discharged on her twentieth postoperative day, wound well healed and having regained her preoperative weight.

She was seen thirteen months after operation at which time she felt perfectly well, had no indigestion, and had gained from 98 to 140 pounds. A barium meal showed a postoperative stomach functioning well.

after the operation, stated that the patient was quite well, and enjoying good health

Case VI—O S, a twenty seven year old white female, was first seen at the clinic April 28, 1932, because of a bleeding duodenal ulcer. For about five years she had had attacks of indigestion, consisting of epigastric distress, coming one to two hours after meals and relieved by eating. On two occasions during this period she had vomited large quantities of blood,



Fig 201—Case VI. Preoperative x ray examination showing a clover leaf deformity of the duodenal cap and a small duodenal diverticulum

the last time being about five weeks previously. Physical examination was essentially negative, except for evidences of anemia. Gastric analysis at that time showed a free acid of 45, hemoglobin 45 per cent, red blood cells 2 510 000. Fluoroscopy showed a clover leaf deformity of the duodenal cap (Fig 201), and a pouchlike defect off the second portion of the duodenum suggestive of a diverticulum. She was transfused, placed on medical treatment for ulcer, and carried along fairly comfortably for the next three years, but in October,

The microscopic report was carcinoma simplex, hyperplasia of lymph nodes. Patient had an uneventful convalescence, and was discharged on his twentieth postoperative day, wound well healed, and feeling fine except for slight discomfort after eating.

Patient was seen again four months after operation, when he had gained 14 pounds in weight, was working part time, had no complaints except vomiting following excessive eating. A letter from the patient's family physician eight months after the operation stated that the patient was still gaining, looked and felt very well, and had no digestive symptoms except occasional vomiting if he ate too much.

Case V—A G, a seventy year old white male, was seen at the clinic October 28, 1935, complaining of abdominal distress present for the last seven months. For the past six weeks he had had considerable nausea and vomiting. He had had no hematemesis, but his stools had been black most of the time for the past seven months. He had increasing weakness and anorexia, and had lost 16 pounds.

He had also had dysuria and marked frequency for the same period. Physical examination was negative except for moderate tenderness in the epigastrium and an enlarged prostate.

Hemoglobin was 98 per cent, red blood cells 4 890 000, white blood cells 13 300, nonprotein nitrogen 38 mg. Barium meal showed an obstructing lesion at the pylorus.

On November 1, 1935, a laparotomy was performed and a prepyloric mass 7 cm in diameter was found with no palpable metastases. This was resected (operation by Dr. Richard B. Cattell), removing about two thirds of the stomach and performing a Billroth I type of anastomosis. The microscopic report was "adenocarcinoma, negative lymph nodes." The patient had a particularly uneventful convalescence and was discharged on the seventeenth postoperative day, wound well healed and having no digestive symptoms.

A letter from the patient's family physician eight months



Fig 20 —Case VII The preoperative x ray examination of the stomach showing a large filling defect in the lower media and antrum This was proved to be a carcinoma of the stomach

except occasional fullness after eating Her red cell count at that time was 4 540 000

Case VIII—E R a fifty six year old white male was first seen at the clinic October 22 1935 complaining of epigastric distress and loss of weight For the past five months he had suffered from fairly constant epigastric distress and although his appetite had remained good he had lost 18 pounds during this time Three years previously he had had an attack of upper abdominal pain and x rays taken at that time were suggestive of duodenal ulcer He had noticed increasing weakness during the past few weeks but had had no vomiting Physical examination was negative except for evidences of emaciation and a moderately distended upper abdomen

Hemoglobin was 90 per cent red blood cells 4 920 000 x Ray examination showed a carcinoma of the greater curvature

At operation (Dr Frank H Lahey), November 9 1935, an egg sized lesion was found located on the greater curvature

1935, because of repeated hemorrhages she was referred to the surgical service. At that time her hemoglobin was 73 per cent, red blood cells 3 450 000 white blood cells 6800.

On November 7, 1935 a subtotal gastrectomy was performed by Dr. Frank H. Lahey, removing about three quarters of the stomach with a Billroth I type of anastomosis. The microscopic report was negative stomach, and diverticulum of the duodenum. Her convalescence was very satisfactory, and she was discharged improved on her seventeenth postoperative day.

Patient was seen ten months after operation at which time she looked and felt well. A letter from the patient sixteen months after operation stated that her appetite was good and that she had had no digestive disturbances.

Case VII—B. N., was seen at the clinic September 3, 1936 complaining of mild gastric distress, vomiting and slight hematemesis present for the past several months. Physical examination was negative except for pallor.

Hemoglobin was 47 per cent, red blood cells 2 710 000 white blood cells 9900. Gastric analysis showed no free acid with a total acid of 8. Barium by mouth showed a large filling defect in the lower media and antrum (Fig. 202) which on fluoroscopic examination appeared to be due to an intragastric tumor.

At operation by Dr. Frank H. Lahey on September 19, 1936 an egg sized tumor in the region of the pylorus completely obstructing the outlet was found. This was resected dividing the stomach about 4 inches above the lesion and using a Billroth I type of anastomosis. The microscopic report on the specimen removed at operation was papilliferous adenocarcinoma with metastases to one of two lymph nodes. She was discharged twenty first day at which time she was or a good deal of her strength.

This patient
time she looked



Fig. 20.—Case VII. The preoperative x-ray examination of the stomach showing a large filling defect in the lower media and antrum. This was proved to be a carcinoma of the stomach.

except occasional fullness after eating. Her red cell count at that time was 4,540,000.

Case VIII—E. R., a fifty-six-year-old white male, was first seen at the clinic October 22, 1935, complaining of epigastric distress and loss of weight. For the past five months he had suffered from fairly constant epigastric distress, and although his appetite had remained good, he had lost 18 pounds during this time. Three years previously he had had an attack of upper abdominal pain, and x-rays taken at that time were suggestive of duodenal ulcer. He had noticed increasing weakness during the past few weeks, but had had no vomiting. Physical examination was negative except for evidences of emaciation and a moderately distended upper abdomen.

Hemoglobin was 90 per cent, red blood cells 4,920,000. x-Ray examination showed a carcinoma of the greater curvature.

At operation (Dr. Frank H. Lahey), November 9, 1935, an egg-sized lesion was found located on the greater curvature.

and this was resected, removing about three quarters of the stomach, with a Billroth I type of anastomosis. The microscopic report was adenocarcinoma with metastases to five of six lymph nodes. Following operation patient did well for forty-eight hours but during the second day marked pulmonary congestion developed. This continued to increase despite treatment on the fourth day he developed a right hemiplegia became comatose and died.

Postmortem examination showed a small well walled off purulent collection at the site of anastomosis, no evidence of a diffuse peritonitis and the cause of death was extensive bronchopneumonia.

Case IX —W F a seventy year-old white male was seen at the clinic September 29, 1936 complaining of epigastric distress worse after meals present for the past month. He had lost 36 pounds in weight during the past three months and during this time he had noticed an increasing anorexia and weakness. For the past year he had been treated for heart disease and was taking digitalis daily. Physical examination showed evidence of weight loss slight tenderness in the epigastrium, but no masses.

Gastric analysis showed a free acid of 4 total acid of 49 with a 2 plus test for blood. Hemoglobin was 93 per cent red blood cells 4 441 000 white blood cells 15 650. A barium meal showed a large dilated stomach with a filling defect at the pylorus, and 50 per cent retention in six hours.

At operation by Dr Samuel F Marshall October 3 1936

very well when on
tried to get out of

bed fell and died almost immediately. Postmortem examination showed that death was due to coronary thrombosis with myocardial infarction. There was no evidence of peritonitis.

Reviewing these 9 case reports in which subtotal gastrectomy was done with the Billroth I type of anastomosis it will be noted that in 6 of the 9 patients, the diagnosis was carcinoma of the stomach and in the remaining 3 cases the diagnosis was peptic ulcer. The ages ranged from twenty seven to seventy-five years, with 4 being over sixty five years of age (67, 70, 70, 75 years). An uncomplicated recovery followed operation in 7 patients. There were 2 fatalities, 1 patient died five days after operation from coronary thrombosis, with myocardial infarction proved by the autopsy findings, while the second death occurred on the fourth postoperative day from broncho pneumonia and a small abscess in the region of the suture line, there was no generalized peritonitis.

To summarize our recent experience with the Billroth I operation we feel that it has a definite place in performing subtotal gastrectomy. It is particularly useful in the elderly poor risk patient with carcinoma of the stomach in the pre pyloric area and only those having less than one half the stomach involved by the lesion. It may be used in some patients having a persisting gastric ulcer. It is not satisfactory in the treatment of intractable and complicated duodenal ulcer. Nine Billroth I resections performed during the past two years have been reported. This group represents but 9 per cent of the gastric resections performed during this period and well illustrates the advantages as well as the limitations of this form of anastomosis after subtotal gastrectomy.

TREATMENT OF BLEEDING DUODENAL ULCER

FRANK H. LAHEY

SINCE duodenal ulcer is nearly nine times as common in our experience now amounting to over 2000 cases of peptic ulcer than gastric ulcer and since hemorrhage in patients with duodenal ulcer is more common than in patients with gastric ulcer 18 per cent in duodenal ulcer and 11 per cent in gastric ulcer it is obvious that bleeding from peptic ulcer most commonly must be dealt with in patients with bleeding duodenal ulcer.

As stated in the discussion in this volume on the Indications for Surgery in Peptic Ulcer bleeding in duodenal ulcer particularly leaves patients and doctors with a false sense of security. But a small percentage of the patients with duodenal ulcer who bleed die but nevertheless this percentage is a real one. As stated in the above mentioned article 5 per cent of these patients in whom hemorrhage has occurred while under treatment in the hospital in our hands have died in spite of anything that can be done. If one visualizes mortality in terms of percentages it is less impressive than when stated in terms of 1 in 20 and the attitude of physician and patient in the presence of bleeding from a duodenal ulcer should not be the relatively confident one that it frequently is but rather the attitude that any bleeding from a peptic ulcer can and occasionally does go on to a fatality.

The important points to discuss in the treatment of bleeding duodenal ulcer are (1) when should these patients be operated upon? And (2) what should be done? As stated in the discussion on The Indications for Surgery in Peptic Ulcer decision for or against operation in the patient with bleeding

ulcer is an extremely difficult and trying one. On the other hand, with the facilities for transfusion at hand today it is usually possible to maintain sufficient blood in the circulation to permit enough time to elapse so that it can be settled as to whether or not bleeding is to cease spontaneously.

Everything connected with hemorrhage from a duodenal ulcer seems to be unsatisfactory in character. As already stated in the previous discussion when surgery must be undertaken in patients who have bled from a duodenal ulcer it is surgery of such magnitude that quite severe degrees of shock are brought about. When surgery must be undertaken in patients with bleeding ulcer their vascular system is so depleted that they are easily shocked even by operative procedures of moderate magnitude. The loss of blood in hemorrhages of this type is so sudden that there is not time for the tissue fluids to be drawn into the circulation and thus in some measure restore vascular balance. If one has had the opportunity to visualize the ulcers *in situ* in which hemorrhage has occurred after the anterior wall of the duodenum has been incised and the ulcer on its posterior wall exposed at operation the conflicting factors present in this situation are immediately obvious. If hemorrhage is still going on the bed of the ulcer will be seen as an open hole in the wall of the artery from which blood is pumping. If the hemorrhage has ceased a raspberry like clot of blood will have accumulated over the lateral opening in the wall of the artery following the sudden drop in blood pressure thus occlusion by clotting being permitted. If immediate transfusion is undertaken the blood pressure may so be raised that the clot is again blown off and hemorrhage resumed yet if transfusion is not given the degree of shock may be such that life is endangered. It has been our experience however that moderate sized transfusions in these patients who have had considerable sized hemorrhages rarely results in such elevation of the blood pressure that bleeding recurs.

As stated in the previous discussion also it is our desire whenever it is possible to avoid surgery immediately following

profuse bleeding from a duodenal ulcer While recurrent hemorrhage is a definite indication for surgery, provided hemorrhage does not recur, we would like to carry such patients under neutralization therapy for a few weeks until the vascular balance has been regained and until some of the induration, infection and ulcer activity in the duodenum has diminished There is no time when technically resection of the duodenum is more difficult than immediately following hemorrhage At such a time the duodenum and pylorus are not infrequently a mass of indurated exudate, the retroperitoneal tissue is involved in inflammatory reaction The wall of the duodenum itself is edematous, friable and easily torn For that reason, in those patients with bleeding ulcer in whom life is not threatened we prefer even though bleeding be an indication for surgery to delay the operation until an interval has existed after the bleeding during which time ulcer activity can be controlled and the local reaction about the ulcer diminished

When a patient is submitted to surgery because of recurrent bleeding in a duodenal ulcer in our opinion provided a patient's condition will permit and the surgical organization is adequate in terms of equipment, that is anesthesia, assistants and apparatus and when the surgeon's judgment and experience is sufficient to justify it, subtotal gastrectomy is indicated While gastroenterostomy may very well result in healing of the ulcer in the patient who has had recurrent hemorrhages, there are two factors against it (1) there are very few patients with duodenal ulcer in whom recurrent hemorrhage takes place who do not have a high gastric acidity (2) there are many patients with peptic ulcer in whom hemorrhage has occurred and in whom hemorrhage will recur even after gastroenterostomy has been done When a patient with a duodenal ulcer has bled repeatedly indications are as stated when reasonably possible (1) to lower the gastric acidity, which can best be done by a high subtotal gastrectomy, and (2) to remove the ulcer and control the bleeding points These two factors offer the patient the best chance for nonrecurrence of the ulcer and permanent relief from his bleeding

There will be occasional cases in which owing to the condition of the patient or the local conditions about the ulcer resection cannot be done. In such cases the stomach may be cut off proximal to the pylorus and turned in, a high gastric resection being done on the remainder of the stomach. This operation is similar to the operation suggested by Devine but involving a higher resection of the stomach and so followed by lower gastric acid value. It is undoubtedly a compromise procedure. There will undoubtedly be patients in whom hemorrhage will still occur in spite of this but it is superior to simple gastro enterostomy although possessing some slight degree of increase in operative risk.

There is little disagreement as to recurrence and repeated bleeding from a duodenal ulcer being an indication for surgery, and while there is little disagreement as to the fact that the ideal type of surgery in the patient with recurrent bleeding from a duodenal ulcer is subtotal gastrectomy together with the removal of the ulcer not a great deal has been said up to recently in regard to immediate operation on those patients with duodenal ulcer in whom recurrent and massive hemorrhage threatens life.

When a patient with a duodenal ulcer has a hemorrhage which so exsanguinates him that life is threatened and in whom further hemorrhage more seriously intensifies the danger in

of morphine quiet withnourishing food and fluid in spite of transfusion that desperate surgery becomes justifiable

When such a condition arises immediate preparation for operation should be made and immediate transfusion undertaken. It is possible in such patients by means of the massive drip transfusion two or three being given at one time if necessary in various veins both arms and a leg to replace the blood as rapidly as it is poured out from a vessel of the caliber which bleeds in duodenal ulcer. When in spite of all measures to control it massive hemorrhage repeatedly occurs a surgical

attack should be made upon the ulcer. When the difficult decision is made that the patient with massive and recurrent hemorrhage from the duodenal ulcer will die unless something is done to control the ulcer, delay beyond this point only adds to the danger of a fatality. When the decision is made the abdomen should be opened and the ulcer visualized. If it is reasonably possible to remove the pylorus from its indurated bed in the duodenum, with sufficient duodenal stump left so that it can be turned in this can be undertaken. If this amount be done when the patient's condition is such that it does not seem justifiable to undertake it, then the anterior wall of the duodenum together with the pylorus may be incised, the bed of the ulcer transfixed with silk sutures until bleeding is controlled. We have in the past transfixed such ulcers with catgut sutures only to have them digested and bleeding recur. Following the control of the bleeding, the patient may be by repeated transfusion gotten into sufficiently good condition so that either subtotal gastrectomy together with removal of the duodenum and ulcer may be accomplished as stated above, or recourse may be had to the compromise procedure of closure of the stomach proximal to the pylorus and a high gastric resection. In direct attack upon duodenal ulcer attempted in the presence of massive hemorrhage, everyone must be prepared for an extremely high mortality. The situation is desperate, as is likewise the risk. It is infinitely better we believe, when once convinced that the bleeding will not be controlled spontaneously, for patient and surgeon to courageously face this risk since it is infinitely better to have such a patient die trying to stop the bleeding and attempting to save his life than to suffer the pangs of conscience which we have all suffered following failure to undertake control of the bleeding vessels in such a condition or failure to undertake it until the prospect of successful accomplishment for practical purposes has disappeared.

It is almost impossible to put in words a description of the patient with bleeding duodenal ulcer, with massive recurrent hemorrhage in duodenal ulcer in whom immediate surgery is

justifiable. One can only say that such cases now and then do occur, that in such cases the dictum that surgery immediately following hemorrhages is undesirable must be violated if one wishes to give these desperate risk patients a chance they deserve.

It is impossible to lay down any standardized suggestions as to in what patient pylorotomy may be undertaken and in what patient transfixion of the ulcer is justifiable. This decision must be made based upon the surgeon's experience, ability and judgment as to the risk at the time the procedure is undertaken and it is here that the surgeon will be damned if he does and damned if he does not, it is here that the highest rewards will be paid for surgical judgment, technical skill and surgical team organization.

Conclusions—There are two types of hemorrhage in patients with duodenal ulcer. In one delay and deliberate surgical approach may be undertaken, in the other immediate surgery is indicated but the decision as to what patient fits this type and what procedure is to be selected is a difficult one and the indications both for the selection of the patient and the type of procedure to be employed owing to the variations in both can never be standardized.

TECHNICAL DIFFICULTIES WITH GASTRIC RESECTION

FRANK H. LAHEY

THERE is no operation in abdominal surgery in which failure can more often result from the omission of small technical details than in that of gastric resection. The stomach situated as it is high up under the costal arches is difficult of approach and while fortunately for healing an extremely well vascularized structure this vascularity occasions bleeding and oozing from its surfaces in profusion when these small vessels are torn and cut without previous ligation. The character of the lesions of the stomach for which gastric resections are done are such also as to add further difficulties to the operative procedure. Ulcers occurring in the duodenum so scar and distort that structure and induration so involves the wall of the duodenum that it makes the surgical management of this portion of the intestinal tube at times extremely difficult. Peptic ulcers of the stomach itself so distort that structure and the induration and erosion of posterior wall ulcers not infrequently penetrating the wall of the stomach and invading the body of the pancreas make the surgical management of that structure also at times extremely difficult. Add to the above difficulties the anatomical variation in individuals such as the thick heavy set short individual and also those persons with large adipose deposits in their mesentery and omentum and one can find the operation of subtotal gastrectomy as trying a procedure as occurs in surgery and one well calculated to tax all of the most experienced surgeon's resources and skill.

There is nothing in the operation of subtotal gastrectomy that more often has to do with its failure than the removal of the duodenum and the safe closure of its stump. One does not

have to worry much about the safe closure of the duodenum in subtotal gastrectomies done for malignancy, since the duodenum is not involved in this lesion is quite normal in character and of sufficient length to make it easy to turn its end in safely by multiple suture lines. On the other hand in gastric resection in patients for duodenal ulcer, a most serious problem not infrequently arises and the proper decision in such a problem plays a considerable part in the mortality of this operation, that is, a decision before removal of the duodenum is undertaken as to whether or not the remaining duodenal stump will be of sufficient length so that its ends can be safely and adequately inverted.

There is nothing more important in performing subtotal gastrectomy for duodenal ulcer than the thorough visualization of the duodenum even its partial mobilization so that one can be accurately aware of the extent of the posterior wall ulceration with its frequent erosion into the pancreas. In these posterior wall ulcerations the particularly important point is to visualize the point in the duodenum at which the common duct enters and the relation of the posterior wall duodenal ulcer to this structure. Not infrequently it has been necessary for us to dissect the common duct down to the point where it passes behind the duodenum in order that we might visualize the relation of the ulcer to this point and estimate satisfactorily whether or not after its removal sufficient duodenal stump will remain for satisfactory inversion of the open end.

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very edge of the remaining duodenal stump

While by mobilization of the short posterior duodenal wall and by turning the anterior wall of the duodenum into the head of the pancreas such complications may at times be surmounted in many situations of this character duodenal fistulae will result with all of the dangers and difficulties attendant upon this undesirable complication. In the patient with ex

tensive posterior wall ulceration of the duodenum in whom subtotal gastrectomy is being done, time cannot be better spent than in the careful estimation of the relation of the ulcer to the entrance of the common duct into the duodenum and the amount of duodenum which will remain for inversion

When it is believed that the duodenal ulceration has extended too far down the duodenum to permit its removal with safe closure of the end, the operative procedure proposed by Finsterer should be employed. Either the duodenum should be cut off just above the ulceration and its end turned in or, better still, the stomach cut off just proximal to the pylorus leaving sufficient stomach to turn the tends in. By this procedure a duodenal ulcer is left intact but in our experience as stated in another paper in this volume on this subject, when high subtotal gastrectomy is done even though the ulcer be left in, the end results have been quite satisfactory. It is much better in such cases to accept the risk of leaving the ulcer together with a high subtotal gastrectomy than to be faced with the inability of satisfactorily closing the duodenal stump after its extensive removal.

Satisfactory closure of the duodenal stump in subtotal gastrectomy has particularly to do with how well one is able to free the posterior wall of the duodenum from its pancreatic attachments. This area is profusely supplied with small friable vessels that bleed easily and it requires great pains and patience to free an adequate amount of this structure from the pancreas for satisfactory closure. Using mosquito hemostats one can with patience control all of the small bleeding vessels, tie them with fine silk and with gentleness and persistency often under seemingly hopeless conditions obtain an adequate amount of duodenal stump for satisfactory closure.

There has been nothing that has given us greater satisfaction, particularly in the management of duodenal stumps, than the employment of fine silk for ligature of these bleeding vessels.

One of the most important points in dealing with the duodenal stump in patients with duodenal ulcer is to realize that all

duodenal ulcers cause a web of scar tissue to be deposited over the duodenum and that if this web of cicatricial tissue be carefully dissected from the duodenum, that structure will spring up and spread out into a tube of surprisingly increased proportions providing thus an increased amount of duodenal wall for adequate closure

Because one wishes to avoid contamination there is a tendency on everyone's part to put two clamps upon the duodenum and pylorus and to burn between the two with a cautery, to then oversee the duodenum withdraw the clamps and invert the stump. While this is a very good way to close the duodenal stump when that structure is uninvolved in ulcer and of adequate length such a method wastes a valuable part of the duodenal stump and may very well make adequate inversion of the duodenal end difficult if not impossible. As has been advocated frequently by many men in describing subtotal gastrectomy for duodenal ulcer it is much superior to cut the duodenum straight across without clamps or better still to crush the duodenum in a clamp to cut proximal to the clamp to then pick the cut end of the duodenum up in Allis tacking forceps open the duodenum suck out its contents and then invert the open end of the duodenum with an in-out and over Connell suture of catgut. By means of this procedure none of the duodenal stump is wasted and with the suction tube immediately inserted into the duodenal stump no soiling occurs. Following the closure of the duodenal stump with the continuous catgut suture carefully applied interrupted mattress sutures of silk should be inserted. We have definitely come to believe that where there is the slightest question of the danger of leakage in any of the gastric or intestinal resections there is no suture material comparable with silk and there is no type of suture safer than the interrupted mattress suture inserted with silk. The technical difficulties of gastric resection have often largely to do with those associated with the removal of the duodenum and pains and patience spent in the removal and safe closure of these structures will be well rewarded in this operation.

Subtotal gastrectomy for duodenal ulcer in order to be effectual must be a comparatively high one. One, therefore, should spend some time in visualizing carefully on the lesser and greater curvatures the point at which it is desired to transect the stomach. In gastric resections for gastric ulcer particularly, it is of the utmost importance to carefully clear the lesser curvature of the stomach of its fat and vessels, to establish definitely the relation of the point of entrance of the esophagus into the stomach with the extent of the ulcer. Particularly in gastric resections for malignancy there is no more important point than this. Not infrequently have I undertaken resections of the stomach for cancer, extending particularly along the lesser curvature, only to find when I had cleared and exposed the lesser curvature that the extent of the resection had been carried up onto the wall of the esophagus.

Before undertaking resections for gastric cancer, not only should the body of the stomach itself be thoroughly investigated for the extent of the lesion, but a careful palpation of the gastrocolic omentum should be made for extensive glands within that structure, careful palpation of the gastrohepatic omentum likewise should be done for metastatic glands and most important of all the lesser peritoneal cavity should be opened through the gastrocolic omentum, one's hands inserted behind the stomach well up on the posterior wall to determine the extent and involvement of the posterior wall and cardia in the malignancy. It is important also to determine whether or not the malignancy has extended beyond the stomach attaching that structure by extension of the growth to the tissues posteriorly.

There is no situation in which a surgeon can display his surgical judgment and experience better than at that time when by palpation, exposure and complete investigation he determines whether or not a carcinoma of the stomach is safely removable and whether or not its removal in terms of risk and possible relief is justifiable.

As evidence of the fact that subtotal gastrectomies undertaken particularly for malignancy may result in resections

much more extensive in character than was originally anticipated, at least half of the total gastrectomies which I have done were not planned as total gastrectomies previous to the operation, but developed into total gastrectomies as the operation became more and more extensive during its performance. It is, therefore, of the greatest importance in doing subtotal gastrectomy either for ulcer or cancer to carefully visualize the amount of stomach which will be left following the removal of that portion of the stomach containing the lesion and it is to be remembered that anastomosis of the jejunum to very small sections of the cardiac end of the stomach are technically extremely difficult, trying and, because of the added risk, open always to the grave danger of leakage and peritonitis post operatively.

While everyone may not agree with this position, it has definitely with added experience become my conviction that there is no more important technical point in subtotal gastrectomy than thorough cleansing of the greater and lesser curvature of its fat and vessels so that the stomach can be safely and accurately inverted and sutured at these angles.

In total gastrectomy of which we have had 4 successful cases and in the very high subtotal gastrectomies in which but a short stump of stomach will remain the suggestion proposed by Mr. George Grey Turner is an excellent one. It consists of detaching the left lobe of the liver from the diaphragm and rotating it to the right. The attachment of the left lobe of the liver is quite avascular. It can be picked up between the fingers and its attachments readily cut away from the diaphragm, since these are only peritoneal in character. The left lobe of the liver then folds to the right upon its hinge at the point where its separate vascularization occurs in such a manner that the entire left half of the diaphragm is exposed. This is an extremely valuable maneuver particularly when the jejunum must be anastomosed to the esophagus in total gastrectomy and also of value in the very high subtotal gastrectomies.

In all subtotal and total gastrectomies it has been our cus-

tom not to employ clamps. When one employs intestinal clamps in this operation one is limited in the height at which the resection can be done and the value of traction upon the stomach itself which can be obtained without clamps is lost. We have now for several years done all of our anastomoses and gastric resections without clamps and if the stomach be well walled off with a cellophane pad such as I have described and the suction apparatus be intelligently employed, little or no soiling need occur. With the duodenum severed, with the stomach wrapped up a gauze pad, rotated to the left and pulled up that structure serves as a very useful tractor to bring about exposure of the greater and lesser curvature and even in total gastrectomy one may by traction upon the stomach so bring down the esophagus that very excellent exposure and accurate anastomoses may be done between the side of a loop of jejunum and the end of the esophagus.

An important point to remember in gastric resection is the length of jejunum necessary to approximate that structure to the cut end of the stomach. One should realize that a segment of jejunum with a much longer mesenteric root is necessary than at first appears. One should realize that when the jejunum is brought up to the stomach when that structure is pulled down from its position in the left hypochondrium that while this jejunum may have adequate mesenteric length to be readily approximated to the stomach at this point, as soon as the anastomosis is completed and the stomach is permitted to fall back into the abdominal cavity it promptly retracts high up into the left hypochondrium with dangerous traction upon the suture line. It is, therefore, we feel of great importance to find the loop of jejunum sufficiently low down so that it passes freely either behind or in front of the transverse colon and even with the stomach in very high position has a mesentery of such length that it does not result in traction upon the suture line. This is a point not appreciated by those inexperienced with gastric resections and one for them to carefully have in mind.

Opinions are greatly divided as to whether one should em

ploy posterior anastomoses or anterior anastomoses in gastric resections. We have customarily employed the Hoffmeister type of gastric resection closing the upper half of the transected stomach and anastomosing the jejunum to the lower half. For a number of years we did almost entirely posterior anastomoses but due to the fact that there is so much tendency for the distal loops of jejunum anastomosed to the end of the stomach to become kinked particularly as it passes through the posterior leaf of mesentery, we have now for at least the last two or three years employed almost entirely antecolic anastomoses of the jejunum to the cut end of the stomach.

When a posterior anastomosis to the stomach can be done so that the rent in the mesentery of the transverse colon can be sutured to the stomach about the anastomosis and so that the anastomosed portion of the jejunum and stomach lie well out in the greater peritoneal cavity then posterior anastomoses are satisfactory. When however, the jejunal loop must pass through the mesentery of the colon and rest there kinking and angulations of the distal loop are much more apt to occur than when the anastomosis is of antecolic character. On the whole we have found antecolic anastomosis to the stomach much more satisfactory, much less complicated by kinks and obstruction to the jejunum than those put through the posterior fossa.

It will surprise many to realize that for a number of years in the antecolic anastomoses with long loops of jejunum no entero-enterostomies have been done and the results have apparently been quite as satisfactory as when entero-enterostomies were done. Here again we believe that interrupted mattress silk sutures in the external coat of the anastomosis between the stomach and jejunum are by far the safest type of sutures to employ.

In the high gastric resections and total gastrectomies great care should be exercised when the ligatures of the vessels along the greater curvature pass by the splenic region not to injure the vessels running into that structure. Only recently such an injury occurred in my own experience requiring splenec-

tomy to be added to almost total gastrectomy for carcinoma and undoubtedly adding to the hazard of a fatality

A very definitely portion of the mortality which we used to have in connection with subtotal gastrectomy was connected with wound complications. A study of mortality rates in our patients on whom subtotal gastrectomy was done showed definitely that in those patients with wound infection and wound complications there is added a definite increased incidence of pulmonary complications and it is definitely our conviction that the complication of wound infection or wound disruption together of course with pulmonary complications plays a considerable part in the mortality of subtotal gastrectomy

There has been nothing which has improved the condition of our wounds more than the elimination for the most part of catgut suture material in the closure of these large epigastric incisions. Two or three years ago we gave up all catgut in the closure of abdominal incisions following subtotal gastrectomy employing entirely through and through mass sutures. Silkworm gut and various types of wire have been employed until we have now selected in the last two years waxed and braided silk as the best and most satisfactory suture material. In a number of cases through and through sutures with no closure of the peritoneum whatever was employed but we have come now to the conviction that a single layer of chromic catgut inserted in the peritoneum closing that structure adequately and then the employment of through and through mass sutures of braided and wax silk put reasonably close to the edge of the incision and reasonably close together is the best way of closing these wounds and results in the fewest postoperative complications.

While we have not been entirely free from wound contamination in such cases the incidence of wound rupture and wound contamination since we have employed this form of suture has been very much less than when catgut layer suture was employed.

Another factor which has undoubtedly decreased our incidence of wound infection in gastric resections is the employ

ment of the cellophane gauze drape which I described in the Journal of the American Medical Association, June 1, 1935. These cellophane pads are made by the nurses. A large strip of cellophane is placed between two thicknesses of gauze, the ends of the gauze turned and hemmed on the machine by the nurses. These are then sterilized in the autoclave and when wet are as soft as a wet handkerchief and may be draped over the wound edges to protect them from soiling during the period when the stomach is being resected.

One final factor has undoubtedly played a large part in eliminating some of the technical difficulties of gastric resection and that is the part played by anesthesia. In the beginning of our experience, nearly all gastric resections were done under ether. This was undesirable in that the operations were long, the patients were carried to considerable depth and often seriously shocked. Following this spinal anesthesia with novocain was undertaken but was in a considerable measure unsatisfactory in that these patients not infrequently came out of the anesthesia at a critical point in the operation during the high resections and during the high anastomoses. At this time patients in whom the blood pressure had already dropped required that a general anesthetic be given and the patient carried to a considerable depth with considerable shock resulting. Following this we undertook our gastric resections with intratracheal ethylene, regional and splanchnic anesthesia and this was a very satisfactory form of anesthesia. By the combination of intratracheal ethylene anesthesia plus regional anesthesia adequate relaxation was obtained even for total gastrectomies and with the introduction of splanchnic anesthesia, control of blood pressure drops was in a considerable measure accomplished. It was not however until the introduction of dilute nupercaine spinal anesthesia as suggested by Jones of London was made that the most satisfactory type of anesthesia was accomplished.

By the employment of 1 to 1500 dilute nupercaine anesthesia it is now possible to obtain high spinal anesthetics lasting three, four and even five hours with complete relaxa-

tion and with even less drop in blood pressure as the result of the spinal anesthesia than occurred in the one and one half hour spinal anesthesia with novocain

There has been nothing which has lessened the technical difficulties of subtotal gastrectomy more than the development of this dilute nupercaine type of high spinal anesthesia. Since these patients are placed upon their face immediately following the introduction of the anesthetic and since the nupercaine mixture is lighter than spinal fluid and ascends to bathe the posterior root one must expect that occasionally in these patients the addition of a little gas in the form of cyclopropane will be necessary. There will be occasional rare times in which there will be complete motor relaxation but the presence of a moderate degree of sensation. In such cases very adequate relaxation will persist over hours but a small amount of gas may need to be given to relieve the patient of the painful stimuli penetrating through the sensory root. The employment of nupercaine anesthesia requires an expert knowledge of not only its technical introduction and the position in which the patient should remain but also the factors determining the limitation of the height to which it is permitted to ascend. Dilute nupercaine anesthesia in the hands of those expert in its administration has been one of the great additions to the accomplishment of subtotal gastrectomy.

Conclusions—There is no operation in surgery where greater skill and judgment can be exercised in avoiding technical difficulties than in that of subtotal gastrectomy. There is no operation in surgery where greater judgment can be exercised in selecting the case in which a subtotal gastrectomy can be done with reasonable safety and that which cannot be done with reasonable safety than that of subtotal gastrectomy.

There is nothing which has added more to the avoidance of technical difficulties in subtotal gastrectomy than the development of dilute nupercaine spinal anesthesia.

POSTOPERATIVE COMPLICATIONS FOLLOWING SUBTOTAL GASTRECTOMY

SAMUEL F. MARSHALL

COMPLICATIONS occurring after the operation of subtotal gastrectomy are of importance because of their effect upon the mortality rate. With an increasing experience the technical mishaps which account for a large percentage of postoperative deaths have fortunately been gradually corrected and the operative hazard has thereby been reduced. In this country with an increasing acceptance of the operation of partial gastrectomy for the surgical treatment of peptic ulcer interest in this subject has grown because of the better late results obtained following this operation. It still must be conceded however that while the remote effects of conservative gastric surgery are not the most desirable, yet the mortality rate is lower than that of the more radical procedures.

In this clinic we have utilized the method of subtotal gastrectomy with gratifying results on an increasing percentage of peptic ulcer patients who have failed to obtain relief under excellent medical treatment. It is of interest to note that only 8 per cent of our duodenal ulcer cases have required surgical management during the past ten years and during the same period 23 per cent of our gastric ulcers have been submitted to surgery. However it is only through painstaking attention to the many technical details of the operation that the operative hazard has been reduced and consequently these serious complications avoided. It is important also to emphasize the necessity for early recognition of these dangerous postoperative complications and to take active steps to remedy them. This in many instances may mean decision for or against reoperation.

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principally to the fact that all of our patients receive 1500 cc of a 5 per cent glucose saline solution by hyperdermoclysis before going to the operating room. We prefer instillation of the fluid by this method rather than by vein because the vascular system will absorb fluid over a long period of time from the tissues into which it is given and thus a more prolonged effect is obtained. Furthermore, we have found during the past year that even the mild degrees of shock previously noted after

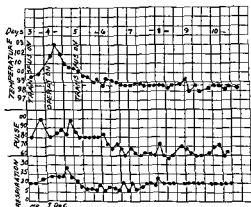


Fig 204.—Carcinoma of stomach postoperative care J DeC male age sixty six. Onset of symptoms four months before admission weakness anorexia nausea loss of weight. High subtotal resection performed for a large ulcerating carcinoma which was prepyloric with most of the tumor on the lesser curvature. Very easy convalescence and early excellent drainage of remaining portion of stomach. Discharged upon nineteenth postoperative day wound completely healed.

operation are less apt to occur where spinal anesthesia is employed, using a dilute solution of nupercaine. Previous to the employment of nupercaine anesthesia we found it necessary to induce splanchnic block by novocain infiltration in the retroperitoneal tissues because prolonged traction upon the stomach often produced a fall in the blood pressure. This undesirable feature has less frequently occurred with the dilute nupercaine spinal anesthesia. Following operation we have routinely given a transfusion of 500 cc of citrated blood and

Nothing can be more satisfying to a surgeon doing gastric surgery than to witness the smooth, uneventful convalescence of a patient following an operation of the magnitude of subtotal gastrectomy and fortunately this has become increasingly true rather than the exception (Figs 203, 204)

It is only through considerable personal experience and by means of the combined experience of the pioneers in this type of surgery, who early encountered these mishaps, that we have so improved our technic that we have learned to expect and to

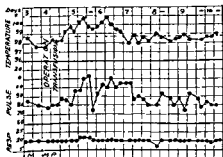


Fig 203—Duodenal ulcer postoperative course after subtotal resection M P male age twenty six history of hemorrhage intractable duodenal ulcer with symptoms for six years ulcer deep penetrating posterior wall lesion total HCl 76 Four fifths of stomach resected anterior Hoffmeister type of gastroyejunostomy Extremely uneventful convalescence out of bed on twelfth postoperative day discharged on twenty first day in excellent condition Drainage of stomach free at all times following operation and Levine tube not needed after first twenty four hours

witness an uncomplicated recovery except in rare instances We admit that this may be true to a lesser extent following resections for carcinoma of the stomach because a more extensive operation must usually be performed because patients with carcinoma are usually past middle age are frequently in a poor state of health, and because of the absence of hydrochloric acid which seems to so satisfactorily account for the sterilization of gastric contents

Severe shock is seldom seen following even so prolonged an operation as subtotal gastrectomy This we believe is due

following resections for carcinoma since one does not commonly choose such a radical method for peptic ulcer patients who have serious heart disease. We have several times seen congestive heart failure following subtotal resection for carcinoma of the stomach and recently we have had a man of seventy years expire suddenly from coronary occlusion on his sixth postoperative day. This patient was known to have an gina pectoris, a severe grade of chronic myocarditis and a partial heart block but at operation an early obstructing prepyloric carcinoma was removed with the patient standing the operation without shock or any other unfavorable reaction. For five days the postoperative course was decidedly uneventful. Serious degrees of cardiac pathology should be recognized and the risk accepted for these cases before considering such radical surgery. We must call attention to the fact that when congestive heart failure is not present postoperative edema is occasionally indicative of the presence of infection and this infection should be carefully searched for.

Peritonitis is certainly the most serious postoperative complication and commonly results in a fatality. With meticulous attention to the technical details of the operation it should occur infrequently. It has long been a well established fact that a highly acid stomach such as accompanies ulcer will sterilize itself within forty eight hours and all ulcer patients who come to surgery should have a period of a few days before operation during which no alkalis are given. With gastric anacidity and with a marked decrease in hydrochloric acid such as is found in gastric carcinoma the stomach will not be sterile itself and with large ulcerating carcinoma various forms of bacteria will usually be present in the gastric contents. It has been our custom for the past year to irrigate the stomach of cancer cases with a very dilute solution of hydrochloric acid for several days before submitting these patients to operation. Great care is taken to have the stomach thoroughly emptied and clean at the time of operation in order to avoid contamination of abdominal viscera through spilling gastric contents when the stomach is opened. We have found that the protection

by this method have in most of the cases avoided all late manifestations of shock

In our experience the most dangerous complications have been pulmonary in character and of 18 deaths following subtotal gastrectomy over a period of ten years, 50 per cent have followed chest complications. It has been our practice to employ oxygen tents immediately after many prolonged operations and we very often have seen patients particularly elderly patients, with gastric resections improve markedly following the use of oxygen. Our attitude toward the employment of oxygen tents has been if in doubt to employ them. This has been particularly true in patients with marked pallor not due to shock and we have learned from experience that anoxemic states may and do exist at times without cyanosis. Obviously oxygen therapy has proved to be extremely valuable in the treatment of pulmonary complications should they arise and this fact is well recognized. Suction of the trachea through the bronchoscope of accumulated bronchial secretion is also worthy of comment and occasionally we have relieved patients of distressing postoperative obstructions to respiration by this method. This method of suction is particularly applicable to patients with massive pulmonary collapse and we are firmly convinced that it has been of great value to us. We do not hesitate to immediately employ it after the onset of massive collapse and have done so in several instances with most gratifying results.

Without doubt the improvements in anesthesia for so prolonged an operation as subtotal gastrectomy have added greatly to the safety of the operation. It is we believe significant to note that during the past year (1936) we have had 4 deaths in 34 cases subjected to subtotal gastrectomy for ulcer and none of these deaths was due primarily to pulmonary complications. Previous to this time we had employed inhalation anesthesia, combined with regional field block, but during the past year spinal anesthesia has been employed using a dilute solution of nupercaine 1:1500.

Cardiac complications are not usually met with except

believe that silk sutures will effectively prevent many such accidents

Subphrenic abscess is rarely seen but one must remember that the type of contamination which occurs occasionally with the difficult dissection of adherent duodenal ulcers is such as to cause subdiaphragmatic or subhepatic collections of pus and with persistent postoperative temperatures, frequent x ray and fluoroscopic examinations should be made for elevation and fixation of the diaphragm, which is often indicative of subphrenic abscess. We do not ordinarily use drains following gastric resections and only in the occasional case where there has been considerable unavoidable contamination or injury to the head of the pancreas do we employ a drain. Wound infections are infrequent and rarely serious but during the past year we have had 2 deaths due to wound infections terminating in peritonitis. Great attention must be paid to adequately protecting the wound edges throughout the operation.

Hemorrhage should be an infrequent complication and certainly the failure to control all active bleeding points is chiefly responsible for it. Hemorrhage must be controlled at the time of operation. This can be done by the so called "hemostatic stitch" and by ligating separately all bleeding vessels. In our hands the dePetz sewing clamp which is used to transect the stomach (Fig 206) has been most valuable in controlling hemorrhage. One will seldom encounter bleeding from the cut end of the stomach after the clips have been applied by the dePetz clamp and after the stomach has been divided between the two rows of clips with the cautery. Most, if not all, hemorrhage will come from the stoma of the gastrojejunostomy and by reducing this stoma, as is done by the Hoffmeister method much better control of the blood supply to the cut end of the stomach is obtained. We have not had a single case of postoperative hemorrhage in 34 subtotal resections during the past year. In our earlier experience postoperative hemorrhage was not unusual and twice we have seen fatalities result from repeated massive hemorrhage from the suture line, proved by postmortem examination. A moderate amount of bleeding

obtained by walling off of the abdominal cavity by waterproof cellophane gauze such as described by Dr. F. H. Lahey to be of great value (Fig 205) in preventing this contamination and by this means avoiding peritonitis

Leaks occurring at the suture line are also a cause of peritonitis but with accurate approximation of the tissues, with great attention to the reinforcement of the angles, and finally

A waterproof wound edge protector consisting of gauze with cellophane stitched between the layers

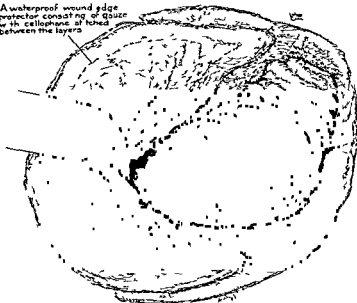


Fig 205—Waterproof cellophane stitched between layers of gauze forms an excellent pad for protection against contamination of wound edges and abdominal viscera Described by Dr F H Lahey

with the use of silk sutures in the serosal coat, these accidents should certainly occur but seldom We now use silk suture material for the serosal layer in all of our cases and we believe that interrupted silk sutures offer a greater margin of safety than a continuous suture of silk Several times we have seen the suture line give away due to digestion of the catgut material with a fatality resulting from abdominal infection, and we

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which is recognized by examination of the drainage from the Levine tube in the stomach or from the vomiting and which occurs without the vomiting of large clots will usually be con

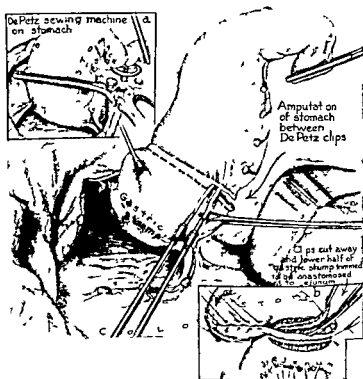


Fig 206—The method of applying a double row of clips by the dePietz
Cautery
clips very
Ioffmeister

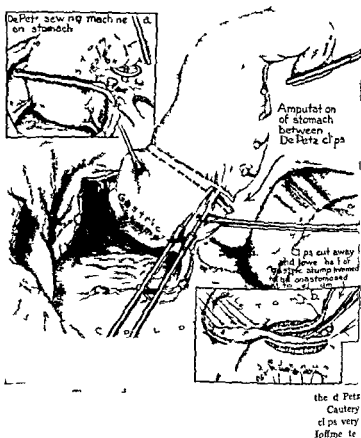
trolled by withholding all food by gastric lavage with moderately hot saline solution and by the frequent administration of morphine. Massive hemorrhage produces extreme exsanguination, rapid pulse, signs of shock and vomiting of large

amounts of blood and blood clots. If repeated large hemorrhages take place, reoperation should be considered and undertaken early even though these patients may present grave risks because of their poor condition. Transfusion should be carried on during the operation with several donors at hand. The stomach wall will need to be opened and as the bleeding is in most cases at the stoma, the bleeding can be controlled by a continuous interlocking suture of the stomal edges.

Gastric or intestinal obstruction following operation for resection of the stomach is most commonly due to obstruction in the jejunal loop beyond the point of anastomosis and is caused by edema and induration of the jejunum or by adhesions forming after operation. Occasionally the obstruction is caused by kinking of a short proximal loop or torsion of the jejunum and it is our habit to leave a generous loop of jejunum (8 to 12 inches) proximal to the anastomosis. During the past year we have made all of our gastrojejunal anastomoses anterior to the transverse colon and we believe by this method we are less liable to encounter obstructions, certainly we have no difficulty with obstruction since utilizing the antecolic method. Edema in the mesocolon when retrocolic anastomosis is employed has occasionally caused difficulty. We have had 2 cases where the retrocolic anastomosis was employed in which the obstruction was found to be due to edema and induration in the mesocolon and jejunum. At reoperation, jejunostomy was performed which permitted the patient to be fed until the edema subsided and the obstruction was relieved with both cases surviving.

We regularly employ the Levine tube immediately following subtotal gastrectomy and pass the tube through the nose allowing it to remain in the stomach until normal peristalsis and drainage of the stomach and intestines is resumed. When gastric stasis continues beyond eight or nine days, one can be certain that this is no longer due to edema but rather due to angulation or obstruction in the jejunal loop. Reoperation must be considered and the surgeon should not wait until the patient's condition is too serious to withstand surgical inter-

which is recognized by examination of the drainage from the Levine tube in the stomach or from the vomiting and which occurs without the vomiting of large clots will usually be con-



trolled by withholding all food by gastric lavage with moderately hot saline solution and by the frequent administration of morphine. Massive hemorrhage produces extreme exsanguination rapid pulse signs of shock and vomiting of large

nerve on one side is a very safe procedure but temporary block of both nerves may be accompanied by some risk and should rarely be advised. Digital compression of the cervical portion of the phrenic nerve is occasionally helpful and some abatement of the diaphragmatic spasm is seen with galvanic or faradic stimulation of the nerve.

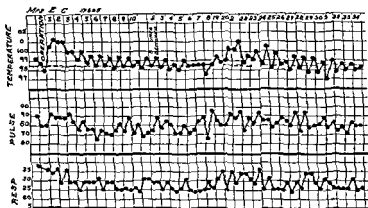


Fig. 207—The above chart demonstrates a typical case of postoperative thrombophlebitis. Following laparotomy a low grade temperature persisted until the sixteenth postoperative day. No cause for this fever in the wound, chest, urine or throat could be found. On the eighteenth postoperative day, as will be seen in the above chart, the patient developed an extensive thrombophlebitis of the right leg with elevation in temperature and pulse. The temperature subsided on the thirty-fourth postoperative day and remained normal thereafter. We keep these people in bed during this period with their affected leg elevated and ice bags applied to the involved area. When the patient's temperature has been normal for a period of at least one week we allow them to get up and around slowly.

Acute parotitis is rare and can often be prevented by great attention to oral cleanliness. Should it develop, mild doses of radium applied early apparently offer the most effective treatment. If the process progresses to suppuration, incision and drainage are of course needed.

Uremia does not usually occur in the type of peptic ulcer case selected for subtotal resection. It is obvious that ulcer patients with marked impairment of renal function are not

ference It may be necessary to release adhesions, to do an entero-enterostomy, or, in some cases, only a jejunostomy is possible When a posterior anastomosis is employed it is particularly important to close the rent in the gastrocolic omentum by suturing the gastrocolic omentum as a cuff about the end of the resected stomach If this closure is incomplete, it may result in obstruction due to a loop of the small bowel entering the lesser peritoneal cavity

Thrombophlebitis occurs following resection as it occasionally does after other major abdominal operative procedures If such a complication arises, the menace of pulmonary embolism and its dramatic termination is always present Certainly blood stasis is a considerable causation factor and patients are encouraged to take mild active arm and leg exercises During the first few days, beginning with the day of operation passive exercises are regularly carried out with the supervision and help of the nurse Should the patient develop thrombophlebitis, we do not allow him to be out of bed until he has had at least a week of normal temperature (Fig 207)

Hiccoughing has occurred occasionally but in most cases is controlled by simple measures such as sedatives or CO₂ inhalations We have found the use of CO₂ inhalations to be most valuable and they can be used safely at frequent intervals The most satisfactory method has been to have the patient breathe a mixture of 5 per cent CO₂ and 95 per cent O₂ until the respiratory rate is increased which usually requires inhalation of the gas mixture for only two or three minutes Coramine has been given intravenously in 5 to 10 cc doses with excellent results Once in a great while hiccoughs will become so persistent that relief will not be procured by these simpler measures For these intractable cases an interruption of the phrenic nerve impulses must be considered and this may be obtained by exposing the phrenic nerve on the affected side and temporarily blocking it by freezing the nerve with ethyl chloride Before proceeding with the phrenic nerve operation the patient should be fluoroscoped to determine which side of the diaphragm is involved Interruption of the phrenic

DIETARY CARE AFTER SUBTOTAL GASTRECTOMY

S ALLEN WILKINSON

A PROBLEM which continually confronts the surgeon and clinician is the dietary care of patients subjected to gastric surgery. This divides itself into two main groups: those cases who have been operated for peptic ulcer and those who have had gastric malignancy. In both classes, the operation of choice is subtotal gastrectomy. Regardless of the type of operation selected, and this varies with the particular condition found at operation, the patient is subjected to a major surgical procedure, one which produces a relatively great degree of postoperative shock, and one which seriously disturbs the normal physiology of the upper digestive tract. All of the various types of subtotal gastrectomy aim at removal of the acid producing portion of the gastric mucosa, and to the degree that they are successful in this they deprive the patient of hydrochloric acid, rennin and pepsin, as well as other less well defined factors responsible for phases of digestion and hormones instrumental in blood formation. In addition, the duodenum is closed off, preventing admixture of food and gastric juices with bile, the pancreatic ferments and the duodenal secretions. It is true that the contents of the duodenum mix with the ingested food but it does so at a point lower in the intestinal canal than is normal. There is also the mechanical factor of an artificial gastro-enterostomy stoma which may cause trouble. If it is too large food dumps from the stomach too rapidly into the jejunum and if it is too small the emptying time is so slow that the patient will complain of fulness and distress after every meal. In the immediate postoperative period the stoma may become edematous and produce all the

fit candidates for such an extensive operative procedure. However, individuals having carcinoma of the stomach frequently are elderly, have poor renal function and not infrequently show evidence of nonprotein nitrogen retention. The fluid intake and output in these patients must be most carefully supervised and the nonprotein nitrogen of the blood must be checked frequently.

It is needless to emphasize in any discussion of the postoperative complications following surgery of the magnitude of gastric resection, that it is of the utmost importance to enlist the cooperation of the internist in the care of all of these patients.

A low morbidity and a decreased mortality rate is dependent upon the early recognition and the immediate treatment of all postoperative complications. What is still more important we should attempt to supervise the postoperative care of these cases in such a manner as will tend to decrease the incidence of these complications. •

GASTRO INTESTINAL SYMPTOMS IN PATIENTS WITH HEART DISEASE

LEWIS M. HURXTHAL

HEART disease is a frequent cause of upper abdominal symptoms. In general these symptoms are brought about in three ways: (1) from pain originating in the heart muscle as that found in angina pectoris or coronary thrombosis or disease of the pericardium; (2) pain resulting from congestion of the spleen or liver along with congestion of other abdominal organs as the result of decompensation with congestive heart failure. In the latter stages of congestive heart failure when ascites is present distention and gastro intestinal symptoms are prominent; (3) pain may arise from emboli which are thrown off from the heart. The three most frequent sites in which occlusion takes place are in the vessels of the spleen and kidneys and in the mesentery.

Almost any gastro intestinal symptoms may arise as the result of any of these disturbances. Gas, nausea, vomiting, pain, loss of appetite and tenderness on palpation are to be expected. For the purposes of this presentation the clinical pictures produced by these three principal causes will be discussed.

DISEASE OF THE CORONARY ARTERIES AND ANGINA PECTORIS

Many patients who develop angina pectoris believe their symptoms are caused by indigestion. It is not difficult to understand why they believe this. One of the characteristic features of angina pectoris is the ability of the patient so afflicted to exercise without distress when his stomach is empty. If he then attempts to do the same amount of activity

sult that he is heartily sick of diets and is convinced that they are not of much value anyway. For just this reason he should have it understood that it is possible to get another ulcer even after subtotal gastrectomy and that his chances of remaining well depend largely on avoiding any precipitating factors which might be instrumental in causing a recurrence. He should be told that a reasonably careful diet in the future is probably his one best insurance against further trouble.

The ulcer patient should therefore be advised to continue for several months on a bland diet with pureed vegetables avoiding spices, fried food, pastry, greasy food, rough cereals and vegetables, alcohol and tobacco. If a gastric analysis after a lapse of several months shows that he has an achlorhydria he can then be permitted to have unstrained vegetables, lettuce, celery, and uncooked fruits.

The carcinoma patient presents a different problem. He probably had a low gastric acid or no acid before operation. If the surgeon feels reasonably certain that he removed all the malignant growth and if he found no signs of metastases it is fair to assume that the patient has a good prognosis at least for a year or more. He does not have to fear that dietary indiscretions will produce a return of his lesion as it is obvious that if recurrence is to happen it will do so in spite of anything the patient may or may not do. Therefore he can be allowed to add foods to his diet as soon as his digestion seems to permit. It is a fairly safe rule to tell him that he may eat anything that does not disagree with him. Because of his achlorhydria he will often be more comfortable if given 20 to 30 drops of a mixture of hydrochloric acid and pepsin diluted in water with his meals. In time his stomach will stretch so that he can eat three meals daily instead of four or five. If he develops a recurrent lesion it often will not appear in the stomach at all and many patients who have had a subtotal gastrectomy for malignancy do not have any serious digestive difficulty up to the time of death.

to have gallstones and tenderness in the right upper quadrant unnecessary and even fatal operation might be performed for suspected gallstone disease. A well taken history of pain related to exertion, the gallop rhythm so frequently present and the electrocardiographic findings should serve to differentiate the coronary thrombosis from other abdominal conditions. When the electrocardiogram is not available the decision is at times difficult.

CONGESTIVE HEART FAILURE

Congestion of the liver from other heart disease besides coronary thrombosis must always be considered. The commonest type of heart disease to be met with is rheumatic heart disease with valvular lesions particularly mitral stenosis and aortic insufficiency. Hypertension and arteriosclerotic heart disease also are frequent causes of heart failure with secondary congestion. Gas discomfort after meals, anorexia and weight loss may be the main complaints. Such patients may be suspected of cancer of the stomach or gallbladder disease. Small collections of ascitic fluids interfere with normal intestinal mobility and usually cause a moderate amount of distention. When congestive heart failure has been present for a long time as in the chronic type of congestion in mitral stenosis the liver may be enlarged and will not repeat after compensation has been restored. Symptoms in patients who have this condition usually are described as a sense of pressure and distress with distention in the upper abdomen. They may be conscious of it almost continuously.

EMBOLIC MANIFESTATIONS

Emboli lodging in the abdominal organs produce clinical pictures which mimic most any acute surgical disease of the abdomen. Every surgeon should consider embolus particularly in those cases which have had an abrupt onset. I have seen patients who have been operated upon for ruptured appendix or have been diagnosed as having renal calculus because of an embolism. Pleurisy is frequently a diagnosis following an infarct of the spleen or an acute pancreatitis or

after eating, and particularly after overeating, he notices distress or pain which may be located from the xiphoid process up the sternum and even into the neck and teeth. With his discomfort, variously described as choking sensation, pressure, pain, squeezing, or filling up, he is conscious of a sensation which he believes is due to gas. What is more convincing to the patient in this regard is that when he belches, he may be relieved of his discomfort. It is not uncommon for such a patient to take soda, which gives him relief. Some even prefer it to nitroglycerin. Many other patients have discovered by themselves that light eating and easily digested foods are followed by less distress. Thus it is perfectly natural to consult their physicians in regard to indigestion. This is particularly true in the few individuals who have angina after rest. They have much less trouble when they do not overeat. Why it is that belching may give immediate relief is not clear. "Gas around the heart" so often complained of by nervous individuals and its relief by belching may have more than fancy as its explanation even though most of the "gas" may have been swallowed. An extreme example of this is occasionally seen postoperatively when there is marked gastric distention. Tachycardia, dyspnea and even cyanosis may be relieved by passing the stomach tube. In such cases the rush of gas from the stomach tube indicates considerable pressure within the stomach has been present.

In coronary thrombosis the pain may be referred to the epigastrium. Nausea and vomiting may at times be extreme. More frequently however these symptoms are present when there is acute liver distention. It is important to discover whether or not the liver is enlarged. Often it cannot be palpated but by pressing on the epigastrium just below the xiphoid procures some resistance and tenderness may be detected. If one must wait until the liver can be palpated below the ribs in the right upper quadrant he will overlook congested livers in many cases. Flatness to percussion over Traube's semilunar space is a valuable sign in detecting early liver enlargement from congestion. Should such a patient be known

EARLIER OPERATIONS IN CHOLELITHIASIS

FRANK H. LAHEY

UP to the time of the development of cholecystography we have been in some considerable measure dependent in the diagnosis of cholelithiasis upon the history of gallstone colic plus the local evidence as determined by physical findings. To be sure gallstones could be demonstrated in a considerable percentage of cases by means of the flat plate. This resulted in the almost universal acceptance of waiting for gallstone colic before advising operation in patients with cholelithiasis. It has resulted likewise in patients being permitted to pass through repeated attacks of gallstone colic before accepting surgery for the condition.

It is definitely my conviction that if patients were submitted to cholecystectomy before they had been through repeated attacks of gallstone colic not only would the end results be infinitely better but the mortality markedly lower.

When patients have had repeated attacks of gallstone colic they will have had repeated attacks of cholecystitis with repeated inflammatory infiltrations in the wall of the gallbladder followed by organization and cicatrization until if enough attacks have occurred the gallbladder is completely destroyed and shrunk down to the size of a peanut. This results in an undesirable situation: numerous pericholecystic adhesions about the gallbladder occur involving the pylorus and duodenum and interfering in some measure with the function of that structure but more important than this as a result of constant *infection within the gallbladder the common and hepatic duct and biliary tree are constantly contaminated resulting in the production of conditions favorable to the formation of stones*

an acute intestinal obstruction may be suspected when the vessels of the mesentery are included. When mesentery vessels are occluded the surgeon will display careful judgment if he decides to intervene at the proper time. If it is done too early, the infarcted area caused by the embolus is not viable so that its extent is unknown. On the other hand when cyanosis is present in the affected area operation may then be useless because the tissues are no longer viable.

Most cases having embolism in the abdominal area have had established auricular fibrillation and most of those also have mitral stenosis. Therefore mitral stenosis with auricular fibrillation is probably the greatest single cause of peripheral embolism.

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being discharged into the main bile duct and that there is constantly as stated above the danger of this infection ascending into the liver

If one visualizes the probable origin of stones within the common duct then one can properly visualize what processes are going on as long as there are stones and there is infection within the gallbladder. It has been assumed repeatedly that stones in the common duct originate within the gallbladder and migrate through the cystic duct to lodge in the common duct. Such may be the case in occasional instances but a more probable theory is that stones within the common and hepatic ducts originate within those structures.

I have personally repeatedly seen stones form within the common and hepatic ducts as evidenced by the following situation. I have repeatedly operated upon patients for stones within their gallbladder removed their gallbladder with its contained stones opened their common and hepatic duct and found there literally hundreds of small stones. These have been very thoroughly removed by scoop suction and irrigation until no further stones could be found. Such patients have returned at the end of four or five years with their common and hepatic ducts again filled with stones in the entire absence of a gallbladder. It seems quite probable that the origin of many common and hepatic duct stones is similar to the origin of stones within the gallbladder that in the presence of an infection in the walls of the common and hepatic ducts as in the walls of a gallbladder that the formation of stones is precipitated.

With the above situation in mind it becomes obvious we think that if patients could be operated upon for gallstones while the stones are still within the gallbladder itself not only would many cases of common duct stones and hepatic duct stones be avoided but even in the absence of these two conditions many cases in which infection within the biliary tree has taken place could be avoided. When one realizes our experience with stones within the common duct as related to no stones within the gallbladder the assumption that stones within the gallbladder tend to produce infection in the common and

within the common and hepatic duct and favorable to extension of the infection within the substance of the liver along the biliary tree

When one thinks of gallstones as in the gallbladder the inclination is to think of the mortality and morbidity of the state as associated directly with the gallbladder. If one excludes the occasional case of acute cholecystitis associated with gallstones the mortality and morbidity of cholelithiasis has not particularly to do with the gallbladder but is related pre-eminently to the presence of stones or infection within the main bile channel.

We would therefore strongly urge that patients be not permitted to go through repeated attacks of gallstone colic but that in all patients with digestive difficulties the gallbladder be investigated by means of cholecystography and even in the absence of colic if stones be found cholecystectomy and possible investigation of the common and hepatic duct instituted. We even believe that there are probably exclusive of the pure cholesterol stones no silent gallstones. We believe that if gallstones be found in the course of a routine examination, they should be removed. In the majority of such cases we believe that later investigation will prove that the digestion has been improved and that there will be a general improvement in the patient's condition. We are of the opinion that it is wrong to permit patients with gallstones even if they are having no immediately urgent symptoms to progress into the later years of their life with their gallstones unremoved because at such a time if the attacks occur the risk of the operation is considerable and one that many patients and many surgeons do not care to undertake.

The assumption when patients have passed through many attacks of gallstone colic successfully that as soon as the attack is over any further progress of damage ceases is a quite wrong one. The attitude regarding gallstones should be we believe, from our experience that in the presence of gallstones there is constantly the presence of infection that in the presence of infection within the gallbladder this infection is constantly

being discharged into the main bile duct and that there is constantly as stated above the danger of this infection ascending into the liver

If one visualizes the probable origin of stones within the common duct then one can properly visualize what processes are going on as long as there are stones and there is infection within the gallbladder. It has been assumed repeatedly that stones in the common duct originate within the gallbladder and migrate through the cystic duct to lodge in the common duct. Such may be the case in occasional instances but a more probable theory is that stones within the common and hepatic ducts originate within those structures.

I have personally repeatedly seen stones form within the common and hepatic ducts as evidenced by the following situation. I have repeatedly operated upon patients for stones within their gallbladder, removed their gallbladder with its contained stones, opened their common and hepatic duct and found there literally hundreds of small stones. These have been very thoroughly removed by scoop suction and irrigation until no further stones could be found. Such patients have returned at the end of four or five years with their common and hepatic ducts again filled with stones in the entire absence of a gallbladder. It seems quite probable that the origin of many common and hepatic duct stones is similar to the origin of stones within the gallbladder—that in the presence of an infection in the walls of the common and hepatic ducts as in the walls of a gallbladder that the formation of stones is precipitated.

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hepatic ducts and stones within the common and hepatic ducts is made more tenable. The point I wish to make is that only in 4 per cent of all the cases of common duct stones which we have seen have there been stones found within the common duct with no stones within the gallbladder. In 96 per cent of the cases in which stones have been found and removed from the common duct stones have also been found within the gallbladder. Thus we believe is evidence in favor of the fact that the formation of stones within the common and hepatic ducts is brought about by the presence of stones and infection within the gallbladder.

One of the reasons that we urge the earlier removal of gallstones is that it is the presence of stones within the common and hepatic ducts associated as they are so often with jaundice and with diminished liver function which result in increase in gallstone mortality particularly by the recurrence of stone within the common duct and necessity for repeated operations upon the duct.

We are strongly of the conviction that once a patient has a stone within the common duct the risk rate of the operation for it is materially increased and the chance of a satisfactory end result materially diminished. Once a patient has had a stone in his common duct the chance of a recurrence of that stone is definitely increased even though all of the stones within the duct are removed—the duct is so often dilated fibrosed and infected and in it are conditions still present even after the removal of the stones for the formation of other stones. Not only will early operation for gallstones be associated with a low mortality rate but it will definitely preserve liver function and normal conditions in the biliary tree. The occurrence of stones within the common duct so often associated with prolonged presence of stones within the gallbladder is a definitely undesirable situation. It does not particularly add to the risk of the operation in the hands of surgeons experienced in common duct surgery to open and investigate common and hepatic ducts and to remove stones from this structure. Rarely, however do stones occur in the common and hepatic duct without marked dilatation of that structure.

and marked dilatation of that structure like hydro ureter indicates back pressure on the liver and dilatation and infection within the biliary tree

We have repeatedly written about the need for surgeons when doing cholecystectomy to investigate and remove any possible stones from the common and hepatic ducts. We have repeatedly stated that jaundice is not infrequently absent in the presence of stones within the common duct. We have shown from the statistical studies of our cases that in 39 per cent of the patients in whom we have found and removed common duct stones jaundice was not present. When one realizes that common duct stones are present in over one third of the cases in the entire absence of jaundice it becomes obvious that if one wishes to operate upon patients with cholelithiasis with reasonable fairness that the suspicion of the presence of common and hepatic duct stones should not be delayed until the onset of jaundice. If this attitude were taken stones within the common and hepatic duct would be missed in over a third of the cases.

While it would be ideal if patients with cholelithiasis could be operated upon before the attack of gallstone colic and before the gallbladder has been destroyed this Utopian position will probably never be accomplished. Even though physicians and gastro-enterologists may not subscribe wholeheartedly to the above statement there are two warnings which they should always have in their mind. One is that whenever a patient is being operated upon for gallstones one should suggest to the surgeon that he be quite sure that a common and hepatic duct stone be thoroughly searched for in order that one may be certain that such a stone is not overlooked. If a patient is operated upon for gallstones and his gallbladder filled with stones removed but a stone left behind in the common and hepatic duct it is quite probable that the stone which is causing the symptoms has been left behind and it is quite certain that the stone has been left behind which is more apt than those stones in the gallbladder to bring about an ultimate fatality. The other piece of advice to be remembered by physicians gastro-enterologists and surgeons is that the pres

ence of jaundice in association with an attack of biliary colic while not absolutely indicative of a common duct stone is sufficiently suspicious so that that patient should be warned of the possible serious consequences unless surgery at the proper time and after the proper preparation be immediately undertaken. He and his family should be promptly warned that in the presence of a common duct stone, the appearance of jaundice has associated with it the very real danger of uncontrollable hemorrhage that diminishing liver function is already present and that these factors are adding daily to his ultimate operative risk.

Conclusions—Due to the fact that gallstone colic tends to be transient in character there is a tendency to delay operative procedures for it. Due to the fact that many digestive difficulties are met by temporizing measures early investigations by cholecystography are often delayed and so early diagnosis often deferred.

If gallstones while in the gallbladder could be diagnosed early and removed before the wall of the gallbladder was destroyed there would be fewer patients with common duct stones, fewer patients with infection of the biliary tract, the mortality would be lower, the number of recurrent common duct stones lessened and the completeness of the recovery greatly added to.

Physicians should urge operation upon patients with gallstones, providing their condition permits as soon as they are demonstrated. They should be demonstrated earlier and certainly no patient without a fair understanding and a frank warning as to the consequences should be permitted to pass through repeated attacks of gallstone colic. No operation should be done for cholelithiasis without thorough investigation of the biliary tract and removal of any possible common or hepatic duct stones.

In the hands of those experienced and familiar with biliary tract surgery, thorough investigation of the common and hepatic ducts together with the removal of stones from these structures does not add to the mortality and definitely diminishes the ultimate mortality.

THE TECHNIC OF CHOLECYSTECTOMY AND CHOLEDOCHOSTOMY

RICHARD B. CATTELL

THE surgery of the gallbladder and of the bile ducts may in some patients be carried out without difficulty, yet in others it may be extremely difficult even for the most experienced surgeon. Satisfactory results following biliary operations depend on a large number of factors. It is obvious that operation should be performed only for definite indications. The best results following cholecystectomy occur in those patients having gallstones and the poorest results are found in those patients having mild or catarrhal chronic cholecystitis. In the latter group there is frequently another functional or organic condition which complicates or is responsible for the preoperative clinical picture. It is frequently necessary to accept patients for operation who come in the group of poor operative risks. Operation in this group is followed by a relatively high mortality. Most of the operations on the gallbladder can be carried out at a time of election and it is extremely important that they be prepared preoperatively to get them in the best possible condition. Satisfactory results are largely dependent on an operation which is carried out with a minimum of trauma with an adequate exposure for the demonstration of the common and hepatic ducts as well as the cystic duct and cystic artery. The technic for cholecystectomy and choledochostomy should provide satisfactory exposure and demonstration of these structures by a definite plan in order that the operative complications of hemorrhage, infection and injury to the ducts are avoided. Unless satisfactory exposure of the common duct is obtained there will be a definite tendency to avoid exploring it for possible stones.

In this paper we wish to present the technic of removal of the gallbladder and of exploration of the common and hepatic ducts as carried out at the Lahey Clinic. The indications for the various operative procedures on the biliary tract will not be discussed.

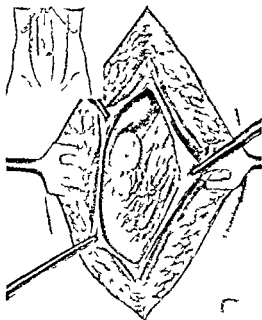


Fig. 208.—Upper right rectus muscle splitting incision showing exposure of gallbladder.

We prefer spinal anesthesia for the good risk patients since it provides the most satisfactory operative conditions. Pontocam with 10 per cent glucose solution is used as the spinal drug in the uncomplicated case while nupercaine is used when it is thought that the operation will require a longer anesthesia. In the poor risk patients cyclopropane with field block is employed.

A right rectus incision is made, splitting the fibers of the muscle in about the midportion, extending from the costal margin to below the level of the umbilicus (Fig 208, inset) The peritoneum is opened in the same line and complete abdominal exploration carried out (Fig 208) The fundus of the gallbladder is grasped by a clamp and lifted upward (Fig 209) and the hand is introduced above the dome of the liver to allow the access of air which permits displacement of the

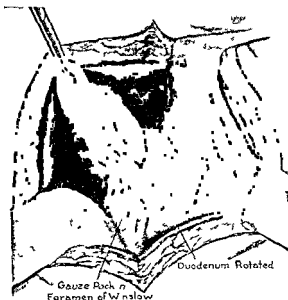
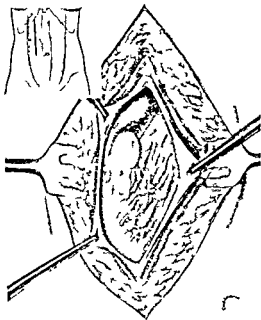


Fig 209—Rotation of duodenum and exposure of foramen of Winslow

liver downward Any adhesions to the gallbladder are divided and a moist gauze pad is introduced displacing the omentum transverse mesocolon and duodenum to the left (Fig 209) This throws the lower edge of the gastrohepatic ligament on a stretch and gives full visualization of the gallbladder and the area of the ducts A dry gauze sponge is introduced into Morrison's pouch as a safeguard against later possible bile spillage A second clamp is then placed on the ampulla of the gallblad

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F 208.—Upper right rectus muscle splitting incision showing exposure of gallbladder

We prefer spinal anesthesia for the good risk patients since it provides the most satisfactory operative conditions. Pontocain with 10 per cent glucose solution is used as the spinal drug in the uncomplicated case while nupercaine is used when it is thought that the operation will require a longer anesthesia. In the poor risk patients cyclopropane with field block is employed.

A right rectus incision is made, splitting the fibers of the muscle in about the midportion, extending from the costal margin to below the level of the umbilicus (Fig 208 inset). The peritoneum is opened in the same line and complete abdominal exploration carried out (Fig 208). The fundus of the gallbladder is grasped by a clamp and lifted upward (Fig 209) and the hand is introduced above the dome of the liver to allow the access of air which permits displacement of the



Fig 209—Rotation of duodenum and exposure of foramen of Winslow

liver downward. Any adhesions to the gallbladder are divided and a moist gauze pad is introduced displacing the omentum, transverse mesocolon and duodenum to the left (Fig 209). This throws the lower edge of the gastrohepatic ligament on a stretch and gives full visualization of the gallbladder and the area of the ducts. A dry gauze sponge is introduced into Morrison's pouch as a safeguard against later possible bile spillage. A second clamp is then placed on the ampulla of the gallblad

der, and the organ displaced to the left (Fig 210) An incision is made in the serosa along the gallbladder, 1 cm from the edge of the liver, and scissors are introduced beneath the peritoneum covering the gallbladder and passed downward to the region of the cystic duct (Fig 210) The peritoneum is divided with a knife leaving a small peritoneal flap 1 cm wide attached to the liver The same incision is continued upward along the fundus to the free edge of the liver This small peritoneal flap is dissected free by blunt gauze dissection The



Fig 210—Incision of peritoneum over gallbladder

gallbladder is now displaced to the right and a peritoneal flap dissected free on the medial side of the gallbladder carefully avoiding the cystic artery and its branches (Fig 211) The ampulla of the gallbladder is lifted upward throwing the cystic artery into relief With a combination of sharp and gauze dissection the cystic artery and cystic duct are dissected free so that each is denuded of peritoneum and fat The serosal incision is continued downward over the common duct, opening the free edge of the gastrohepatic omentum Exposure is thus obtained of the common hepatic and common ducts, and their

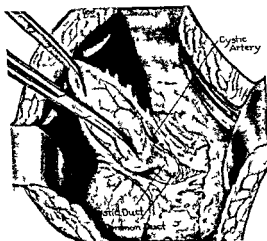


Fig 211—Exposure of cystic artery



Fig 212—Division and ligation of cystic artery

junction with the cystic duct. The cystic artery is lifted up (Fig 212) and divided allowing further elevation of the ampulla of the gallbladder so that the tortuous cystic duct be-

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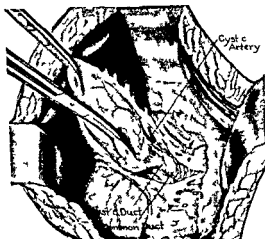


Fig. 211—Exposure of cystic artery



Fig. 212—Division and ligation of cystic artery

junction with the cystic duct. The cystic artery is lifted up (Fig. 212) and divided allowing further elevation of the ampulla of the gallbladder so that the tortuous cystic duct be

comes straight (Fig 212, inset) The junction of the cystic and common ducts is palpated for possible impacted stones following which right angle clamps are placed on the cystic duct a short distance above the junction (Fig 213) Care is taken in placing these clamps under full visualization of the area so that there is no kinking or distortion of the common duct The cystic duct is divided between the clamps and the gallbladder freed from its bed preserving the two peritoneal flaps previously outlined Exposure is maintained after re-



Fig 213—Exposure and ligation of cystic duct

moval of the gallbladder by applying a clamp to the upper portion of the peritoneal flap at the free edge of the liver In removing the gallbladder attention is paid to possible accessory bile ducts in the liver bed When these are encountered they are carefully clamped and tied

The gallbladder is opened and its contents demonstrated to the surgeon as an important guide with regard to possible exploration of the common duct The cystic duct and cystic artery are ligated separately with No 1 plain catgut (Fig 213 inset) In those cases in which there is no indication for ex-

ploration of the common duct the cut edges of the gastrohepatic ligament are approximated over the common duct covering the stumps of the cystic artery and cystic duct (Fig 214 inset) A continuous plain catgut suture is used to close the bed of the gallbladder approximating the two peritoneal flaps previously constructed (Fig 214) These steps result in complete peritonealization of the entire operative field The appendix is usually removed The gallbladder wound is always drained usually with a soft rubber tissue drain passing out



Fig 214 Gallbladder bed with closure of peritoneal flaps

ward from Morrison's pouch through the upper angle of the incision

In 40 to 45 per cent of our patients having operations upon the biliary tract there is some indication for exploration of the common duct This is done by an incision directly in the common duct since it is felt that exploration through the cystic duct stump is unsatisfactory The gastrohepatic ligament is further opened over the common duct down to the upper edge of the retracted duodenum A longitudinal incision approximately 2 cm long is made in the portion of common duct between the cystic duct stump and the duodenum (Fig 215) avoiding the small superficial vessels on the surface of the

comes straight (Fig 212, inset) The junction of the cystic and common ducts is palpated for possible impacted stones following which right angle clamps are placed on the cystic duct a short distance above the junction (Fig 213) Care is taken in placing these clamps under full visualization of the area so that there is no kinking or distortion of the common duct The cystic duct is divided between the clamps and the gallbladder freed from its bed, preserving the two peritoneal flaps previously outlined Exposure is maintained after re-



Fig 213 Exposure and ligation of cystic duct

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The gallbladder is opened and its contents demonstrated to the surgeon as an important guide with regard to possible exploration of the common duct The cystic duct and cystic artery are ligated separately with No 1 plain catgut (Fig 213 inset) In those cases in which there is no indication for ex-

In certain cases the Bakes flexible dilators are used to dilate the opening into the duodenum. Dilators up to size 9 are used. A T tube having short limbs (Fig 218, inset) is introduced into the common duct and interrupted sutures used to approximate the edges of the duct so that there is no visible bile leakage (Fig 217). The gastrohepatic ligament is closed

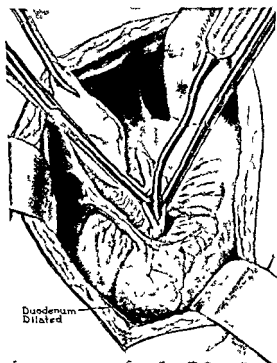


Fig 216—Explanation of common duct

with interrupted sutures (Fig 218), and the gallbladder bed peritonealized. The common duct is never closed without drainage and in all of our cases we have employed a T tube. A cigaret or rubber dam drain is brought out from the level of the gastrohepatic ligament beside the T tube (Fig 218) through the upper angle of the incision. The incision is closed in layers,

common duct The escaping bile is removed by suction and the cut edges of the common duct grasped with Allis clamps (Fig 215) A blunt curved probe is passed downward to the ampulla of Vater and passed into the duodenum if possible The hepatic ducts are next explored The stones are removed from the distal portion of the common duct by means of stone

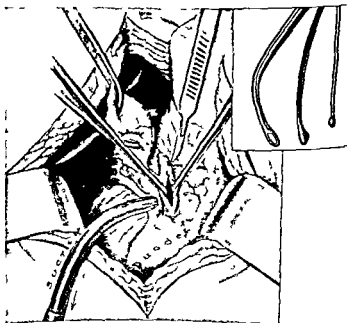


Fig 215 —Opening of common duct

forceps (Blake), or with other suitable instruments (Fig 215 inset) After it is determined that all stones have been removed, the patency of the ampulla of Vater is further demonstrated by passing a small French catheter into the duodenum (Fig 216) With the injection of a small amount of saline solution the duodenum will be seen to distend After withdrawal of the catheter from the duodenum the common duct may be irrigated if debris or common duct 'mud' is present

In certain cases the Bakes flexible dilators are used to dilate the opening into the duodenum. Dilators up to size 9 are used. A T tube having short limbs (Fig 218 inset) is introduced into the common duct and interrupted sutures used to approximate the edges of the duct so that there is no visible bile leakage (Fig 217). The gastrohepatic ligament is closed

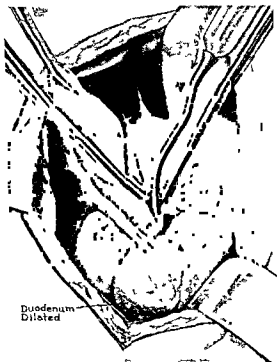


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Fig 21 T tube in common duct

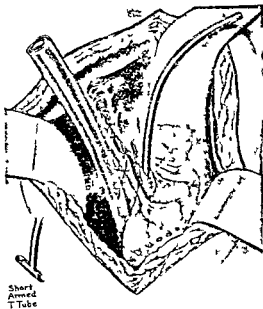


Fig 21B—Drain in pouch of Douglas

being reinforced with a number of braided silk retention sutures (Fig 219)

The technic for cholecystectomy and choledochostomy that has been described is for the usual or uncomplicated case. In patients with acute cholecystitis the gallbladder is removed

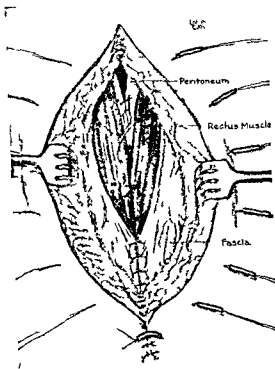


Fig 219—Closure of abdominal wound

from above downward by blunt dissection without making an attempt to preserve peritoneal flaps on either side of the gall bladder. While we feel that removal of the gallbladder from below upward is the operation of choice in the acute cases and in others complicated by marked adhesions and edema in the region of the ducts it is better to carry the dissection from

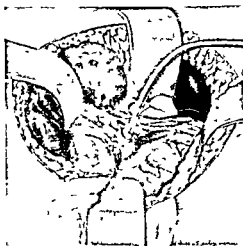


Fig 217—T tube in common duct

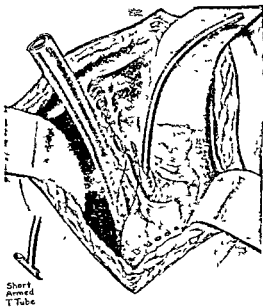


Fig 218—Drain in pouch of Douglas

being reinforced with a number of brided silk retention sutures (Fig. 219)

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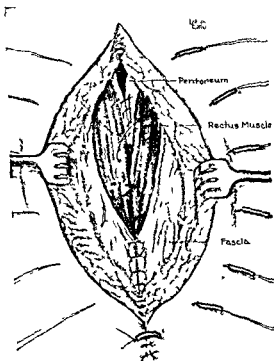


Fig. 219—Closure of abdominal wound

from above downward by blunt dissection without making an attempt to preserve peritoneal flaps on either side of the gall bladder. While we feel that removal of the gallbladder from below upward is the operation of choice, in the acute cases and in others complicated by marked adhesions and edema in the region of the ducts, it is better to carry the dissection from

above downward. In those patients having obstructive jaundice in whom the cause of the obstruction is not certain exploration of the common duct is carried out before removal of the gallbladder so that the gallbladder can be drained or saved for later anastomosis to the intestinal tract where the obstruction is due to carcinoma of the ampulla or pancreas. Again in the poor risk patients with obstructive jaundice it may be important to limit the operation to drainage of the common duct with removal of stones with or without drainage of the gallbladder, leaving the cholecystectomy for a later stage when the patient is in better condition.

Summary—The technic for cholecystectomy and choledochostomy as employed in this clinic is presented. Adequate exposure with demonstration of the cystic duct, cystic artery, common hepatic and common ducts is emphasized. Removal of the gallbladder from below upward is recommended as the operation of choice.

GALLBLADDER DISEASE AND DIABETES

FRANK N. ALLAN

ONE hundred and fifty years ago an English physician Thomas Cowley observed a case of diabetes in which for the first time there was satisfactory evidence of an organic basis for the disease. In a report published in the *London Medical Journal* in 1788 he described unusual changes found at post mortem in the pancreas. The gland was atrophic and the ducts were filled with calculi. A century passed before the experimental production of diabetes by extirpation of the pancreas demonstrated clearly the important role of this organ in the etiology of the condition but since Cowley's time clinicians and pathologists have searched carefully for evidence of pancreatic disease in cases of diabetes. Calculi as discovered in Cowley's case are extremely rare. The cause of other pathological changes has been the subject of speculation and attention has been directed to the possibility of their origin in the neighboring biliary system.

The anatomical relationships of the pancreas are fortunate in some respects. Its deep seated location in the abdomen protects it from external injury yet in other respects it is vulnerable because of its position. In its course to the duodenum the common bile duct comes into intimate relationship with the pancreas and in the majority of cases it is completely embraced by pancreatic tissue for a distance of 2 to 2.5 cm. The bile duct and the main duct of the pancreas usually unite at the ampulla of Vater. Sometimes the junction occurs within the pancreas some little distance from the duodenum. Rarely do they terminate separately. This association of the pancreatic and the common bile ducts may have serious disad

vantages. On the one hand, tumor or inflammation of the head of the pancreas may cause pressure on the pancreatic portion of the bile duct, leading to obstructive jaundice and interference with the function of the liver, and on the other hand obstruction by a stone or spasm at the ampulla of Vater may harm the pancreas as well as the liver. The pancreas may also be damaged by spread of infection from the bile passages into the pancreatic ducts.

The possibility of such ill effects must be encountered frequently since gallstones and other diseases of the biliary tract affect such a large proportion of the population. Pathologists find evidence of cholecystitis and even cholelithiasis in a surprisingly large percentage of autopsies. The data reported by Mentzer¹ in 1927 are impressive and often quoted. He found that gallstones were present in 21 per cent of 600 cases examined postmortem at the Mayo Clinic. Others have noted an incidence varying in different series from 3 to 10 per cent. In the most recent publication dealing with the question Ludlow² reported the presence of gallstones in 6.98 per cent of 4800 autopsied cases. If patients under twenty-one are excluded, the incidence for all adults was almost 9 per cent. In the case of white women over forty years the incidence was 21 per cent, and in the case of men of the same age group 10 per cent. Colored patients of both sexes had stones from one third to one half less commonly in all age groups.

Cholelithiasis and cholecystitis are even more common among diabetic patients. Warren³ found gallstones in 25.3 per cent of 245 cases at postmortem as compared with an inci-

¹ J. C. Mentzer, *A Series of Cases from the Mayo Clinic*, 1927, p. 10.

² J. C. Ludlow, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

³ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁴ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁵ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁶ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁷ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁸ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

⁹ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁰ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

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¹² J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹³ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁴ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁵ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁶ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁷ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁸ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

¹⁹ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

²⁰ J. C. Warren, *A Series of Cases from the Mayo Clinic*, 1930, p. 10.

The number of cases in which cholelithiasis and cholecystitis actually require consideration is relatively high, but the clinical diagnosis of gallbladder disease is seldom made in such a large proportion of cases. In neither diabetic nor nondiabetic cases does gallbladder disease give clinical evidence of its presence with such frequency. It may exist, of course, without

causing any symptoms whatever, or it may affect the patient so little that he never feels the need of medical investigation

Joslin⁵ found gallstones in only 5 per cent of 4589 cases of diabetes studied in 1928. In another series of 1206 cases in 1934, there were 17 cases of cholelithiasis and 11 cases of cholecystitis, representing an incidence of gallbladder disease of 2.3 per cent. My own experience is similar (6.7). Among 840 cases of diabetes seen at the Mayo Clinic in 1930, there were 4 per cent with cholelithiasis, and including cases of cholecystitis without stones a diagnosis of gallbladder disease was made in 5.5 per cent. In 1931 5.4 per cent of cases had gallstones and the total incidence of gallbladder disease was 7.2 per cent. Among 100 unselected cases of diabetes above the age of thirty recently treated at the Lahey Clinic, 6 had operation for gallstones or a history of cholecystectomy for stones elsewhere. In 2 additional cases, gallbladder disease was suspected but the diagnosis was not established. In contrast with these figures is the opinion of Rabinovitch⁸ that gallbladder disease occurs in 25 per cent of his adult cases of diabetes. The observations of pathologists quoted above support this claim. Although one may question the actual clinical importance of the complication in so many cases, I have no doubt that we should recognize gallbladder disease much more frequently than we have in the past.

CASE REPORTS

A study of the cases in the present series in which diabetes was associated with gallstones illustrates certain points of importance in regard to the problem.

Case I—A diabetic patient, age sixty-nine years, was referred to the clinic because of a blood stained vaginal discharge. She was prepared for a pelvic operation but two hours before she was due to go to the operating room, she had a severe attack of biliary colic. It was learned that she had a similar attack of pain two years before. The physician who

was called to see her at that time, discovered the diabetes and according to her history she had had symptoms for several months before. Treatment with diet had been prescribed at first but six months before admission she began to require insulin in addition.

Operation was postponed for a week. Uterine malignancy was excluded by curettage and biopsy, then exploration of the gallbladder region was undertaken. Dr. Lahey and Dr. Adams found a large hard stone firmly imbedded in the wall of the ampulla of Vater. After operation insulin was needed to control the diabetes but a relatively small dosage was sufficient. On dismissal from hospital she was instructed to take 10 units daily but it was expected that this could be discontinued eventually.

Comment—The operative findings represent a classical demonstration of the relation of cholelithiasis to diabetes. The stone had undoubtedly been lodged at the ampulla of Vater for a long time and its presence could account for damage to the pancreas and the development of diabetes. There was no history of diabetes in the family and the patient had never weighed more than 150 pounds so that heredity and obesity as etiological factors were absent. In a case such as this it is easy to appreciate the harmful effects of cholelithiasis on the pancreas.

Case II—A woman of fifty-five had attacks of pain in the right upper abdomen. An operation had been performed elsewhere five years previously. Gallstones were removed and the gallbladder was drained. She began to have recurrence of attacks of pain three years later. A second operation was performed four months before admission. Adhesions were separated in the region of the gallbladder but the pains continued.

Diabetes had been discovered at the time of the first operation. Insulin was used while she was in the hospital but afterward she was treated by diet alone. The diabetes was intensified at the time of the second operation but insulin was not

employed. A strict diet was used. Her weight fell from the original level of 180 pounds to 113.

When she came to the clinic a third operation was performed by Dr. Lahey. He removed a diseased gallbladder. Stones were not found. It was noted that there was induration at the head of the pancreas. The diabetes became much more severe immediately after the operation and 52 units of insulin were needed in one day. Before dismissal there had been improvement again and the insulin could be discontinued.

Comment—In this case as in Case I the surgeon noted a change in the pancreas which might be secondary to disease in the biliary tract. There can only be speculation in regard to the time of its occurrence but it is logical to believe that removal of gallstones and a diseased gallbladder as early as possible might help to avoid the progression of secondary pancreatic changes. One must guard however against drawing conclusions in regard to the beneficial effect of gallbladder surgery in such a case since either improvement or exacerbation of diabetes may be dependent on many other factors.

Case III—A woman aged fifty-two years complained of failing health for two years. She had a poor appetite and her weight fell from 179 to 140 pounds. She felt distress after eating and frequently suffered from nausea. Recently there had been frequent urination and she had begun to drink more water than usual. Cancer of the stomach had been suspected.

It was found that she had diabetes; the urine contained 6 per cent. x-ray examination of the gastrointestinal tract was negative but x-ray of the gallbladder showed a faint cluster of ringlike shadows which were undoubtedly stones. Treatment of the diabetes by diet and insulin brought about improvement in her health but there began to appear attacks of pain at the right costal margin extending into the back. After seven weeks operation was performed to remove the gallbladder. The common duct appeared normal in size and did not contain stones. Subsequently the dosage of insulin required daily declined from 24 units to 5 units. The improve

was called to see her at that time, discovered the diabetes and according to her history she had had symptoms for several months before. Treatment with diet had been prescribed at first but six months before admission she began to require insulin in addition.

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Comment—The operative findings represent a classical demonstration of the relation of cholelithiasis to diabetes. The stone had undoubtedly been lodged at the ampulla of Vater for a long time and its presence could account for damage to the pancreas and the development of diabetes. There was no history of diabetes in the family and the patient had never weighed more than 150 pounds so that heredity and obesity as etiological factors were absent. In a case such as this it is easy to appreciate the harmful effects of cholelithiasis on the pancreas.

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lation. He was advised to continue it after he was dismissed from the hospital.

Comment—When sugar is found in the urine of any patient before operation it is important to guard against danger from diabetes since even mild diabetes may become temporarily severe. In this case the diabetes was recognized in advance of operation almost by accident, since the patient had not been aware of the potential seriousness of the previous glycosuria and failed to give information about it until direct inquiry was made. The frequent occurrence of diabetes in cases of gallstones should lead to additional precautions to avoid overlooking any such latent cases.

Case V—A woman who had had cholecystectomy seven years before was admitted to hospital for investigation of attacks of abdominal pain which had occurred at intervals for three years. Diabetes had been discovered when she was thirty-eight years of age. It was apparently mild and was treated by simple regulation of diet until a series of 3 attacks of biliary colic occurred at the age of forty-six. At the operation there was found subacute cholecystitis and a single stone was impacted in the cystic duct. Treatment with insulin was begun at the time of the operation and it was used continuously thereafter. However the diabetes was not well controlled. The weight fell from 170 to 132 pounds. When she was admitted to hospital for investigation of the abdominal pain she was also suffering from distressing pain and paresthesia in the lower extremities on account of diabetic neuritis. There was in addition pain in the spine and in other joints because of arthritis.

The cause of the abdominal pain was not satisfactorily determined. The presence of a stone in the common bile duct was thought improbable for there were several points against the diagnosis. Jaundice had never appeared. There were no stones in the common duct at the time of the operation and duodenal drainage now did not show any evidence of lithiasis. Pancreatitis, nerve irritation from the arthritis of the spine

ment was only temporary for during a respiratory infection it became necessary to use 60 units. Later, the requirement was 30 to 35 units each day.

Comment—The association of the diabetes with cholelithiasis in this case may have been due to damage of the pancreas resulting from extension of disease from the biliary tract, yet the findings do not permit one to make this definite conclusion. It is noteworthy that the common bile duct appeared normal and that stones were not found in the bile passages. The patient had been obese and the type in which diabetes might develop independently. Here, too, the improvement in respect to the diabetes which followed the gallbladder operation might easily be misleading. Improvement of this degree may be seen in almost any case of early diabetes after control of glycosuria has been established. The subsequent exacerbation with the respiratory infection shows also that one must avoid premature conclusions in regard to favorable post-operative course of diabetes.

Case IV—A man aged sixty five years suffered from pain after eating for ten months. x Ray examination showed an indefinite gallbladder shadow and there was distinct mottling suggesting stones. The x ray of the stomach and colon was negative. Operation was performed and a diseased gallbladder containing a great number of large and small stones was removed.

At the initial examination the urine had contained a trace of sugar but the morning after admission to hospital the blood sugar was found to be normal. On inquiry it was learned that examination of the urine two months previously had shown the presence of sugar and the carbohydrate content of the diet had been restricted to some extent. With this information arrangements were made for diabetic management at the time of operation. It soon became evident that this was needed. A large amount of sugar appeared in the urine and the blood sugar rose to 330. Treatment with insulin was needed for two weeks. Later the urine remained sugar free with dietary regu-

lation. He was advised to continue it after he was dismissed from the hospital.

Comment—When sugar is found in the urine of any patient before operation, it is important to guard against danger from diabetes, since even mild diabetes may become temporarily severe. In this case, the diabetes was recognized in advance of operation almost by accident, since the patient had not been aware of the potential seriousness of the previous glycosuria, and failed to give information about it until direct inquiry was made. The frequent occurrence of diabetes in cases of gallstones should lead to additional precautions to avoid overlooking any such latent cases.

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The cause of the abdominal pain was not satisfactorily determined. The presence of a stone in the common bile duct was thought improbable for there were several points against the diagnosis. Jaundice had never appeared. There were no stones in the common duct at the time of the operation and duodenal drainage now did not show any evidence of lithiasis. Pancreatitis, nerve irritation from the arthritis of the spine

and diabetic neuritis were considered. Fortunately the condition of the patient improved when the diabetes was controlled more effectively. The latter was relatively severe since 50 to 60 units of insulin were required daily.

Comment—The experience of this patient shows that one cannot depend on the hope of cure or relief of diabetes through removal of a gallstone and infected gallbladder. The diabetes had been present for eight years before the acute symptom of gallbladder disease appeared. It became worse at this time and further progression followed long after the gallbladder operation. As a general rule one cannot expect recovery from damage which has already been done.

Case VI—A woman of thirty four receiving treatment for hay fever and asthma had had an operation for gallstones three and one half years before. It was learned that she had had a small amount of sugar in the urine at intervals and on this account a sugar tolerance test was performed. The fasting blood sugar was 119 mg. for each 100 cc. One half hour after 100 Gm. dextrose had been given the blood sugar rose to 190. In two hours it was 230 and in three hours 244. The urine was free from sugar at the beginning of the test but the two hour specimen contained 3.2 per cent sugar (representing 4.8 Gm.) and the three hour specimen 3.4 per cent sugar (2.7 Gm.). Because of this evidence of diabetes dietary regulation was advised.

Comment—Any patient who had had a gallbladder operation may be considered a candidate for diabetes. Special attention should be given to periodic urinalysis. If glycosuria is found a tolerance test as performed in this case may permit early diagnosis of diabetes and thus enable the individual to deal with the condition before actual illness has developed.

CONCLUSIONS

It is difficult to prove that gallstones cause diabetes but statistical data and circumstantial evidence in individual cases indicate that diabetes may be secondary to cholelithiasis and

infection of the biliary tract. The frequent association of diabetes and gallstones particularly in women over the age of forty should lead the physician dealing with one of these conditions to guard against overlooking the other.

Any patient who has had gallstones or an operation for gallbladder disease should be advised to have periodic examination of the urine. The discovery of even a trace of sugar in the urine should be followed by a blood sugar test and if the blood sugar is normal a sugar tolerance test should then be performed. The discovery of early diabetes may save the patient from the effects of serious diabetes later in life.

Diabetic patients particularly middle aged women who complain of any digestive disorder should have investigation of the possibility of gallbladder disease. The diagnosis and removal of a diseased gallbladder may spare the pancreas additional damage. Cure of diabetes already present should not be expected and although improvement often occurs after cholecystectomy credit should be given not simply to the operation but to the institution of a diabetic regime, reduction of weight and other factors.

The importance of early diagnosis and control of diabetes is well recognized. The importance of recognition and surgical removal of gallstones before they have led to irreparable damage should also be emphasized.

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decision since in one of these three states, surgery is extremely undesirable, that is, when the jaundice is the result of infection within the bile passages and bile radicles

Not only is it undesirable to institute surgery on the patient with a jaundice which is a result of infection within the bile radicles but this method of treatment is obviously quite ineffectual. Any surgeon who under the mistaken diagnosis of possible malignancy has opened and drained the common duct in patients with jaundice of the so-called "catarrhal" character has had demonstrated to him how ineffectual the procedure is as one would logically assume it would be. Not only is there a limited amount of bile discharged but the bile is of pale yellowish color containing but a limited amount of bile pigment. In addition there are no apparent benefits which ensue as a result of this drainage. That this is the natural course of events is to be logically assumed since the infectious process is within the parenchyma of the liver and the jaundice the result of a pathological state here and not an obstructive type of jaundice due to mechanical blocking of the bile passages.

In the presence of such infection it has been definitely demonstrated that anesthesia and the trauma associated with operations upon the bile passages further diminishes the liver function. It is therefore distinctly of advantage to arrive at a proper diagnosis in those patients with painless jaundice before advising operative procedures. The presence of a silent common duct stone causing painless jaundice is unusual. That it does occur, however, is demonstrated by the fact that we have occasionally removed such a stone and have occasionally seen such a stone at autopsy in patients in whom operation was not undertaken. While undoubtedly rare one must admit that a silent common duct stone must always be considered a possibility in patients with painless jaundice. In such cases valuable evidence may be obtained by duodenal drainage. In

in which painless jaundice will be due to a silent common duct stone is, however, very small. Nearly all cases of painless jaundice will be due either to a jaundice secondary to infection of the liver or a carcinoma of the head of the pancreas.

One of the most valuable diagnostic measures available in the diagnosis of carcinoma of the head of the pancreas is Courvoisier's law. Courvoisier's law has been criticized by many and is undoubtedly open to considerable error. It is, however, sound in principle and when the positive portion dealing with a possible carcinoma of the pancreas is present, it is of distinct advantage not only in the diagnosis of carcinoma of the head of the pancreas but also as to the indication for the need and wisdom of palliative anastomosis of the distended gall bladder to the duodenum or jejunum.

Courvoisier's law is: 'In the presence of jaundice a distended gallbladder which is palpable through the abdominal wall is indicative that the obstructive jaundice is due to carcinoma of the head of the pancreas or to carcinoma of the common duct below the point where the cystic duct enters the common duct. This is the portion of Courvoisier's law which has to do with malignancy of the pancreas. The other portion of Courvoisier's law is: In the presence of jaundice, a contracted gallbladder is indicative that the biliary obstruction is due to stones within the common duct.'

If we comprehend the mechanism of Courvoisier's law in both of its aspects it becomes of added value. Why does a contracted gallbladder in the presence of jaundice suggest that the biliary obstruction is due to stones? Just as we have stated in other papers in this volume dealing with cholelithiasis so here the contracted gallbladder is evidence of the repeated attacks of cholecystitis so often associated with gallstones. A gallbladder which has contracted from its normal size, that of a small pear down to that of a small peanut, must have been the site of repeated infection within its wall and when such repeated infections have existed over a sufficient period of time so that the scar tissue contraction as the result of these infections has resulted in such shriveling of the gallbladder that it

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bladder with progressive pressure upon the walls of the common duct there is progressive distention of the normal elastic walled gallbladder. The obstruction to the duct produces the jaundice. The back pressure within the common duct up the cystic duct and in the gallbladder produces the distention. This then is the mechanical explanation of that portion of Courvoisier's law. In the presence of jaundice a dilated gallbladder is indicative of obstruction due to malignancy and this is of value particularly as relates to advising for or against surgery in such cases since unless the gallbladder is dilated and the obstruction below the point where the cystic duct enters the common duct the palliative operation of cholecystenterostomy or cholecystoduodenostomy will not be of value.

The sidetracking of bile from the distended gallbladder into the duodenum or jejunum is a very worthwhile operation since by this means jaundice can be made to disappear and the troublesome itching and mental depression and stupor so often associated with deep jaundice can be overcome. Many of these patients live comfortably for several months and occasionally two or three years before dying from the slow growing carcinoma within the head of the pancreas.

Courvoisier's law is definitely opened to a considerable percentage of error. If however certain additions be made to Courvoisier's law as we have suggested and employed it will be found to be quite accurate in determining for or against the diagnosis of carcinoma of the head of the pancreas. We have made the following additions to Courvoisier's law to increase its accuracy and usefulness. They are in the presence of jaundice which is persistent, painless and progressive together with consistently acholic stools when the gallbladder is palpable through the abdominal wall the obstruction is in practically all cases due to cancer of the head of the pancreas.

The employment of anastomosis of the distended gallbladder in patients with carcinoma of the head of the pancreas and with jaundice as already stated has been a most satisfactory operative procedure and one which has been well worth carrying out in patients with this condition. Not only does this

has reached the size of a peanut, it is obvious that long continued infection must have been present in the common and hepatic ducts. Such long continued infection will in a majority of instances produce conditions favorable for formation of stones within the common duct.

Every surgeon who is familiar with biliary tract disease is aware of the fact that when one finds a contracted gallbladder in a majority of instances, a common duct stone will be found. The other portion of Courvoisier's law, in the presence of jaundice, the gallbladder which is dilated and palpable through the abdominal wall is indicative that the obstruction is due to carcinoma of the head of the pancreas is likewise explainable on a basis which fits itself well into the actual findings at the time of operation. When one has a carcinoma of the head of the pancreas usually there is a normal gallbladder unassociated with stones. The musculature in the wall of the gallbladder is intact. Its elasticity and distensibility is entirely normal and it is capable of distention up to its full extent. When then a carcinoma involves the head of the pancreas there is gradual encroachment of the carcinoma upon the main bile duct, since in a good many of the cases the common duct runs directly through the head of the pancreas. With piling up of individual cells progressive compression occurs with gradual and progressive distention of the gallbladder. The situation in carcinoma of the head of the pancreas as it gradually encroaches upon the common duct is quite similar to what happens to the kidney and ureter with carcinoma of the cervix.

If a string be tied about a ureter this does not produce for instance a hydronephrosis as is commonly known by all physiologists and surgeons. This produces provided there be no infection within the kidney an atrophy of the kidney. If on the other hand a carcinoma of the cervix involves the parametrium so that the ureters are gradually encroached upon in a way comparable with the encroachment upon the common duct by the head of the pancreas then a hydro ureter and a hydronephrosis results. Similarly with encroachment upon the common duct, in the presence of a normal, elastic walled gall

fluids, glucose and transfusions is desirable but should not be persisted in over a period of days

One of the most important contributions to the management of the deeply jaundiced patient due to carcinoma of the head of the pancreas is that of Walters in the suggestion that these deeply jaundiced patients have their distended gallbladder temporarily drained until they are relieved of their jaundice, and until their liver function has been recovered at which later time the gallbladder may be anastomosed to their intestinal tract by a secondary procedure

One of the most important factors in the operative management of these patients with their deep jaundice and lowered liver function is the anesthesia. Patients with lowered liver function stand anesthesia insults to their liver quite badly. In terms of degree of injury to the liver and in order of seriousness, the anesthetics may be stated as follows: obviously chloroform produces the most undesirable effect upon the liver, ether next, nitrous oxide with its low percentage of oxygen next, ethylene with its next lowest percentage of oxygen next, cyclopropane with its high percentage of oxygen next and local anesthesia or spinal anesthesia the most desirable of all forms of the anesthetics in terms of injury to the liver.

Cholecystenterostomy may be accomplished by anastomosing the gallbladder to one of three sites. The gallbladder may be anastomosed to the stomach; it may be anastomosed to the duodenum or it may be anastomosed to the jejunum.

We have always felt that it is undesirable to anastomose the gallbladder to the stomach for the reason that when this union has been made, if the pylorus be in any degree obstructed by spasm, kinking or an inflammatory lesion, the powerful contractions of the stomach propel its contents into the gallbladder up the cystic duct and into the lesser bile radicles within the liver. In such a patient when bismuth is given by mouth we have seen an excellent picture of the entire biliary tree secondary to the powerful motor contractions of the stomach forcing the bismuth through the gallbladder and up into the bile ducts. In addition to this disadvantage, the thick-

sidetracking of bile up the cystic duct through the gallbladder and into the duodenum or jejunum relieve obstruction but there are undoubtedly occasional cases in which the obstructive lesion in the pancreatic head or the point in the duodenum into which the common duct leads, where the obstruction is not malignant in character. Unfortunately, it is not often feasible to remove sections from the head of the pancreas for biopsy and the decision as to the possible presence of malignancy in the head of the pancreas being the cause of obstruction to the duct must largely be a matter of inference and the result of one's impression from palpation of the head of the pancreas.

If an attempt be made to remove a section of the head of the pancreas for biopsy conditions arise which considerably complicate the operation. There is a great deal of oozing from the point where the specimen is removed. It is difficult to control the exposure is difficult and many of these patients being jaundiced bleed more profusely than do the average patient. In addition to this the condition of many of the patients operated upon for this state is a precarious one and in such patients the additional risk in removing a section of tissue from the head of the pancreas for biopsy is not justified. The length of time over which some of the patients upon whom we have done cholecystenterostomy for jaundice have lived can be explained we believe only by the fact that in some of the cases the obstruction was benign in character. In addition cholecystenterostomy will relieve jaundice in the occasional rare case in whom the obstruction may be due to a common duct stone which cannot be palpated.

The operative management of the jaundiced patient with a distended gallbladder is an entirely different one from that of the management of the jaundiced patient in whom the jaundice is due to a stone within the common duct. The jaundice due to malignancy in the head of the pancreas will persist and intensify in spite of all temporizing measures. It therefore is wise to undertake whatever procedure is decided upon at the earliest possible moment. The employment of

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ness of the musculature of the stomach together with the loose redundant mucosal rugae of the stomach lend themselves less well than do the duodenum and jejunum to accurate suture between the thin gallbladder wall and this structure. We therefore, believe that except when unavoidable, anastomosis between the gallbladder and the stomach is undesirable.

There are many factors also making anastomosis between the gallbladder and the duodenum unsatisfactory. The wall of the duodenum are relatively thin, friable and easily torn, the duodenum being but partly intraperitoneal often cannot be freely mobilized and the gallbladder must be drawn down to that structure to bring about the anastomosis. Furthermore, following anastomosis of the gallbladder to the duodenum, since the duodenum is fixed if vomiting occurs and the liver ascends and descends violently there may be considerable traction upon the suture line and even rupture and leakage. Due to the fact that the duodenum cannot be mobilized the introduction of the posterior suture line cannot be inspected after it is once put in and the technical difficulties of suturing an intrahepatic type of gallbladder to a relatively fixed duodenum may be quite considerable and at times even impossible.

For a number of years now we have employed anastomosis of the jejunum to the distended gallbladder with complete satisfaction and we believe with greater technical ease than the anastomosis between the gallbladder and either the duodenum or the stomach.

A long loop of jejunum at 2 or 3 feet from the ligament of Treitz is found, brought up over the transverse colon at the hepatic flexure and attached to the gallbladder by a posterior row of sutures. The gallbladder is then tapped, sucked free of its contents, the abdomen walled off and a direct anastomosis made between these two structures by suture. Two tacking sutures are placed between the duodenum and the capsule of the liver on either edge of the anastomosis to take the strain off the suture line.

The above plan of employing the jejunum permits of ready approximation of the intestines to the gallbladder at any level.

should there be vomiting it permits this loop of intestine to ride up and down freely with the liver and gallbladder postoperatively and the introduction of bile into the jejunum at a level 2 or 3 feet below the ligament of Treitz has been quite as satisfactory from the patient's point of view as has been its introduction into the duodenum or the stomach. We believe quite definitely that the jejunum at the intestinal level at which the gallbladder is anastomosed in patients with jaundice secondary to obstruction from carcinoma of the head of the pancreas is just as satisfactory as cholecystoduodenostomy or cholecystgastrostomy and technically very much easier and safer to do.

There are but one or two warnings to be stated in connection with the surgical management of carcinoma of the head of the pancreas. If in doubt as to whether or not the gallbladder should be drained as a preliminary measure it should be drained. The secondary suture of the drained gallbladder to the jejunum is not difficult and with patients in such improved condition is infinitely more safe.

There will be occasional cases when the plan here suggested of anastomosing the gallbladder to the jejunum cannot be employed. They will be the cases in which the patients are fat; there are large adipose deposits in the mesentery and omentum and the mesentery of the jejunum is short. In such cases it will not be possible to obtain loops of jejunum with sufficient mesenteric length so that they can be carried up over the transverse colon to be anastomosed to the gallbladder without traction. If on selecting a loop of jejunum 2 or 3 feet or even 4 or 5 feet from the ligament of Treitz the mesenteric length is insufficient then any attempt to anastomose the gallbladder to the jejunum should be given up. One must remember that the jejunum must be of more than sufficient length to rest against the gallbladder comfortably. Otherwise should there be postoperative distention in the transverse colon there will be no slack in that structure to be taken up; traction will be made upon the line of anastomosis and leakage result.

Conclusions —The diagnosis of carcinoma of the pancreas has to do with the determination of the cause of pancreatic jaundice

Courvoisier's law with a few additions has proved a very worth while one in the diagnosis of carcinoma of the head of the pancreas causing and producing jaundice

The anastomosis of the gallbladder to the intestinal tract is a useful operation and has produced worth while comfort in these patients

It is recommended that the gallbladder be anastomosed to the jejunum rather than to the stomach or duodenum when cholecystenterostomy is contemplated

REGIONAL ILEITIS

HERBERT D. ADAMS

REGIONAL ileitis is a chronic inflammatory disease of the small bowel usually involving the terminal ileum of unknown etiology and of great surgical importance primarily because of the complications arising chiefly in the later stages of the disease namely obstruction and perforation. This condition has been variously classified in the literature as regional or terminal ileitis, chronic cicatrizing enteritis, nonspecific benign or infectious granulomata of the intestine, and in the European literature has been referred to as phlegmonous enteritis. This varied terminology has developed due to a lack of knowledge of a specific etiological agent making a descriptive clinical and pathological classification necessary.

A study of the gross and microscopic pathology of this disease provides at least an opportunity for a comparative study with other more specific chronic inflammatory diseases of the bowel and an opportunity to speculate upon the origin of this interesting disease. The process is usually limited to the small intestine and more especially to the ileum. It is most advanced in the terminal ileum (Fig. 220) and rarely involves the jejunum. In this series the jejunum was involved in 1 case and the cecum and ascending colon involved in several cases. In the case illustrated the chronic process was present in the ileum and the most recent and acute involvement was in the cecum. A low power microscopic section (Fig. 221) through one of these early areas in the cecum shows intact intestinal mucosa and glands just beneath which is a small abscess filled with polymorphonuclears. The surrounding submucosa shows an acute and chronic inflammatory process. It is conceivable

Conclusions—The diagnosis of carcinoma of the pancreas has to do with the determination of the cause of painless jaundice

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Fig 220—Gross specimen of regional ileitis showing greatly thickened wall obstructed lumen and extension of process onto cecum



Fig 221—Low power microphotograph of early acute lesion with involvement of the submucosa and intact mucosa

that the infection had dissected down through the submucosal layers of the ileum into those of the cecum without involving the mucosa, but it seems more reasonable that it is a new

primary focus. It is felt, therefore, that the infectious agent, whatever it may be, attacks the submucosa first and produces ulceration of the mucosa secondarily.

The gross appearance of the bowel is quite similar to that seen in chronic ulcerative colitis. The serosa is red and injected and often covered with grayish-white fibrous strands which may be adherent to other loops of intestine. The wall is markedly thickened, rigid, and fibrotic and upon section is grayish white and porky. The thickness varies from 5 to 15



Fig. 222—Low power microphotograph of the chronic stage showing involvement of all layers of the bowel.

mm. This fibrosing process reduces both the circumference and lumen of the bowel. When obstruction is encountered, it is due to both a reduction of the lumen and to kinking and adherent serosal surfaces.

The mucosa is for the most part diffusely ulcerated. In some cases the mucosa between ulcerations is thrown into coarse papillary folds producing pseudopolypoid masses, such as are seen quite frequently in chronic ulcerative colitis. Chronic perforation is also quite common.

Microscopically the process also simulates ulcerative colitis. The mucosa is usually absent and the submucosal tissues are replaced by vascular granulation tissue with a marked non specific chronic inflammatory process characterized by an infiltration of lymphocytes, plasma cells, large mononuclears and polymorphonuclear eosinophils (Figs 222, 223). Although the most involved layer seems to be the submucosa there is in almost all cases a definite involvement of the muscular serosal layers and the mesentery. The mesenteric glands are

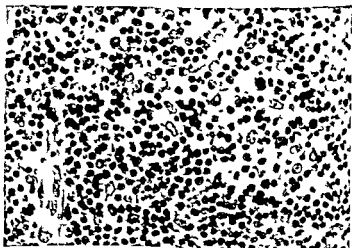


Fig. 223—High power microphotograph showing the infiltration by a non specific chronic inflammatory process

usually enlarged and show a similar nonspecific chronic inflammatory process. Huge foreign body giant cells (Fig 224) with as many as 30 nuclei are occasionally present a finding that is not observed in ulcerative colitis and suggest tuberculosis or lues as a causative agent. It is possible that because of some such findings as these the disease was classified as tuberculosis before this disease became known as a definite clinical and pathological entity not many years ago.

A study of the clinical aspect of the disease is equally

interesting In selecting this series, only operated cases were included, since it was only in these cases that a positive diagnosis of regional ileitis could be made There were other cases treated by the gastro intestinal department in which the symptoms and x ray studies strongly suggested this condition but which have done well on a medical regime and have not required surgical intervention Since the diagnosis is not certain in these cases they were not included, but they suggest, as do some of the operated cases that the disease can be self limited

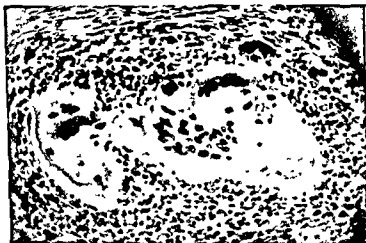


Fig 224 —High power microphotograph showing a huge foreign body giant cell occasionally found in these specimens

and may resolve completely even after having attained an advanced stage There is one case in this series which had an abscess, due to a perforation of a regional ileitis, drained as the only surgical procedure and when explored two years later at the time of a gastric resection for ulcer, the regional ileitis had completely subsided

There were 15 cases in this group operated upon and a definite diagnosis of regional ileitis made A study of the data tabulated on these cases permits some interesting generalizations It is most commonly a disease of early adult life,

Microscopically the process also simulates ulcerative colitis. The mucosa is usually absent and the submucosal tissues are replaced by vascular granulation tissue with a marked non specific chronic inflammatory process characterized by an infiltration of lymphocytes plasma cells, large mononuclears and polymorphonuclear eosinophils (Figs 222, 223). Although the most involved layer seems to be the submucosa there is in almost all cases a definite involvement of the muscular serosal layers and the mesentery. The mesenteric glands are

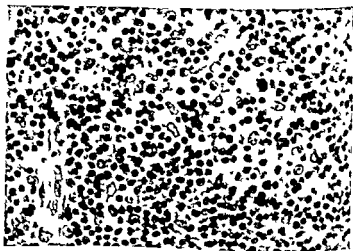


Fig 223—High power microphotograph showing the infiltration by a non specific chronic inflammatory process

usually enlarged and show a similar nonspecific chronic inflammatory process. Huge foreign body giant cells (Fig 224) with as many as 30 nuclei are occasionally present a finding that is not observed in ulcerative colitis and suggest tuberculosis or lues as a causative agent. It is possible that because of some such findings as these the disease was classified as tuberculosis before this disease became known as a definite clinical and pathological entity not many years ago.

A study of the clinical aspect of the disease is equally

REFUGAL I LIT & CALES

Case No.	Bl.	Pl.	S. no.	Pl.	parties	Physic	R. H.	D.	C.	R.
3	F m	one	Abolition Jan 2 D be met 3 am d for W ch Jan 28	None	T dectum exam R L Q	no	no	Turn de m ed ex m b by d last m m m on m 2 R m m	no	seed 2 m.
4	F m		La 3 d 2. 1. 1.	N	T m	N	N	lap hae op d 2 R serious m d m m m d m	P m	Good 2 m.
20	F m	3 m m.	3 m m. W m m do	on	m m m m m	m m m m	F m m m	T m m m m m m reluctant m	N m	m
2	m	m.	Admission reg 2 W m m m m	pe dectum at m m m m m	T d m m m Q	T m m m m m	T m m m m m m m m m m m	Term m m m m m m at m 2 R m m m d m m		Good m
20 M	m	m	do W m m m m		D m m m m m m	N	N	T m m m m m m m m m m m m m m	one	seed 2 m.
55	F	m	do m m m m m	m m m m m m m	T d m m m m m	one	one	Term m m m m m m m m m m m m m	None	seed 2 m. m d m m m m
22	F	m	do m m m m m	m m m m m m m	T m m m m m m	N m m	N m m	T m m m m m m m m m m m m m m	A d m m m m m m m m m	Good 2 m.
2	F m	m.	A do m m m m m m m	La m m m m m m m m m m m m m m	pe dectum at m m m m m	Partia de m	Partia de m	Term m m m m m m m m m m m m m	R m m m m m m m	Good m.
5	F m	m m m.	do m m m m m	N	T m m m m m m	T m m m m m m	T m m m m m m	Term m m m m m m m m m m m m m		La m m m m m

(four to six weeks) a resection done, and 2 had Mikulicz resections. All of 9 resected cases have done well and are symptomatically well from one month to four years postoperative.

There were 3 cases in which an ileocolostomy only was performed, which are interesting since 2 are well six months and three years thereafter, and the third died from extensive infection of the abdominal wall and multiple fecal fistulae and represents the other fatal case.

There were also 3 cases in which simply drainage of an abscess, caused by perforation of a regional ileitis, was done with catheter enterostomy in addition in 2 of these. One of these was the early acute fatal case already discussed, and the other 2 were well three months and two years later, respectively.

A study of these results would indicate that a complete eradication of this disease by resection in the majority of cases is the treatment of choice. In support of this, 9 cases of resection without a death and with excellent end results are presented. A two stage operation was performed in twice as many cases as the one stage procedure and is generally deemed safer by us and other contributors on this condition. There were 2 deaths in the cases having a less radical treatment of the disease giving a mortality of 13.3 per cent for the entire series. The short-circuiting ileocolostomy is dangerous since it leaves the diseased bowel as a source of infection, chronic perforation, abscesses, fistulae and a constant menace to the health of the patient. Operation in the very early acute stages should be avoided if possible, but if it becomes necessary to establish with certainty the diagnosis in an acute abdomen and this disease is found in its early acute phase, it should be handled with great conservatism, limiting the operation to minimal exploration only, placing the patient on a strict peritonitis or Ochsner regime, and delaying resection to a subsequent chronic stage of the disease.

and although the youngest in this series was sixteen years of age and the oldest sixty nine the average age was thirty six years. The disease was slightly more prevalent in women than in men in a ratio of 9 to 6. The duration of the disease varied greatly but the average for this group was two years. The most common and typical symptoms were abdominal pain diarrhea at onset or intermittently constipation vomiting general debility and weight loss. Eight of these patients had had previous operations elsewhere usually appendectomy or lysis of adhesions and half of these had had 2 previous operations. Only 1 in this group had had a previous resection and had a recurrence requiring a second resection representing one of the operations in this series. In general with the exception of the early acute stages and in abscesses associated with the disease physical signs in the form of abdominal tenderness and spasm and systemic reaction were minimal. x Ray was helpful in making the diagnosis in only one third of the case.

Only 2 of these cases were operated upon in the early acute stage. One of these upon opening the abdomen ten days after onset of acute symptoms showed a segment of markedly injected and inflamed jejunum which was very edematous and dilated covered with fibrin and bathed in cloudy free peritoneal fluid. The abdomen was closed without further operative procedure the patient placed on a peritonitis regime recovered and six weeks later a resection done on a typical chronically obstructed bowel of the chronic cicatrizing type. The other case which represents 1 of the 2 fatal cases developed a fulminating peritonitis within a week following an interval appendectomy and although an enterostomy and drainage was done the patient rapidly succumbed and post mortem showed an early acute stage of regional ileitis with multiple perforations.

The remaining 13 cases were in the late chronic stages—the stenotic and fistulous phases described so well by Crohn. Nine cases were resected 3 in one stage with a primary anastomosis of the bowel 4 in two stages—a preliminary ileotransverse colostomy was performed and later

THE CLINICAL VALUE OF MORPHINE AND PITUITARY EXTRACT, PITRESSIN IN ABDOMINAL SURGERY

HERBERT D. ADAMS

NUMEROUS publications in this country and abroad have resulted in considerable confusion as to the action, clinical application and value of morphine and certain pressor fractions of pituitrin known as pitressin in abdominal surgery. The reports of their effect on the bowel and on the postoperative course of various series and types of abdominal cases have been more general than specific. The purpose of this work has been to determine the definite action of these drugs on the bowel in human subjects and to observe carefully their clinical effect and value in a small but well-controlled series of abdominal cases.

The action of morphine and pituitary extracts on the bowel has been studied many times but until recently the majority of these experiments and most of the data collected have been on a basis of animal experiments. The effect on the bowel in the various types of laboratory animals has been inconsistent and has not been in keeping with the action observed in human subjects. The intestine of the dog and of the rabbit usually respond to pitressin by a slight increase in tone and a cessation of peristalsis similar to the action of morphine.

To observe the effect of these substances on human bowel the following experiments were carried out. Four cases having an ileostomy and an equal number having a colostomy performed for various conditions but all well beyond the convalescent stage and in good condition were selected. Using a fasting subject a soft compressible elongated balloon sealed to a small rubber tube was introduced into the bowel inflated

ment of certain intra abdominal conditions, notably peritonitis and mechanical intestinal obstruction, we did not feel free to use it indiscriminately in a series of unselected cases. Fifty consecutive cases were therefore selected in which a thorough abdominal exploration was done, including palpation of the upper abdomen, exposure of the pelvis, and a moderate amount of handling of the small bowel. These were selected because it was felt that in this group no harm could develop as a result of this investigation and chiefly because this group of cases is notably uncomfortable and usually present varying degrees of abdominal distention.

Alternating cases were used as controls and for contrast, and a definite postoperative regime established for each group. Group I, in which pitressin was used, received the following postoperative orders:

Pitressin Amp 1 stat on arrival on the ward and every four hours by the clock for 6 doses (thereafter by special order)
 Exact intake and output chart for three days
 Water ad lib postnausea
 Medium head rest
 Medication for pain to be ordered only as single doses by the investigator

Group II represented the control and contrast cases using morphine and our usual routine postoperative orders:

Morphine gr $\frac{1}{4}$ subcutaneously every three hours or as needed
 Exact intake and output chart for three days
 Water ad lib postnausea
 Medium head rest

A careful detailed study of these two groups of cases was then carried out, using the following outline as a basis for comparison:

Preoperative condition

- 1 Bowel function (constipation, diarrhea, last movement, catharsis and enemas)
- 2 Vomiting
- 3 Degree of abdominal distention
- 4 Degree of peristalsis
- 5 Degree of hydration (thirst, tongue, specific gravity of urine)

and connected with a drum for kymographic records. When the peristalsis caused by the introduction of the balloon had ceased the drugs were injected subcutaneously and their action recorded on smoked drums (Fig 225). The results were consistent throughout and the graphs submitted represent typically the effect on the ileum and on the colon. In both

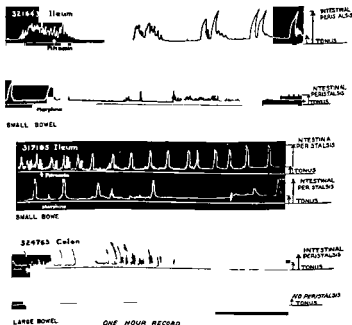


Fig 225—Kymographic records showing the action of pitressin and morphine on small and large intestine

small and large bowel the effect of pitressin was to produce a slight increase in the general tone and a marked stimulation of peristalsis. The effect of morphine on both was an even greater increase in general tone and an almost complete cessation of peristalsis.

Since the above observed action of pitressin on the bowel is incompatible with our present conception of a rational treat-

in senteric border will not withstand vigorous stimulation of peristalsis. Under such circumstances the intestine will perforate at its weakest point which is usually the cecum. The author has known of such disastrous complications arising from the injudicious use of pitressin and other similarly acting drugs such as eserine, physostigmine and prostigmine in 4 cases of advanced ileus—3 following operations on the genito-urinary tract and one in a nonsurgical case of marked ileus associated with pneumonia. These 4 cases were given repeated doses of these substances each producing definite fecal results but accompanied suddenly by signs of peritonitis and all were found to have a perforation of the cecum at operation and postmortem examination.

In conclusion pitressin has a definite place in abdominal surgery as has morphine. The fact that it has a much greater effect in stimulating peristalsis than morphine makes it of greater value perhaps as a prophylaxis against ileus as well as a very definite therapeutic effect in cases where ileus has developed in mild and moderate degrees. In addition we may add that it has been quite effective in keeping these patients comfortable postoperatively although it is hard to explain satisfactorily the exact mechanism of such an effect. On the other hand morphine in our experience has not been a causative factor of distention and ileus which is readily explained by its action of increasing the general tone of the bowel as well as diminishing peristalsis. These important effects make morphine most ideal in the treatment of peritonitis and mechanical intestinal obstruction and because of the definite peristaltic effect of pitressin we feel that the latter is contraindicated in these two conditions and in advanced degrees of ileus.

Operative findings

- 1 Pathology (type and extent)
- 2 State of intestines (degree of distention tone degree of peristalsis)

Postoperative course

- 1 Vomiting
- 2 Degree of abdominal distention
- 3 Degree of peristalsis
- 4 Abdominal discomfort (subjective objective)
- 5 Amount of morphine or other sedatives required
- 6 Bowel function (spontaneous movements enemas)
- 7 Bladder function (voided catheterized)
- 8 Degree of hydration (thirst tongue intake output)
- 9 Postoperative nourishment (carbohydrate protein)

The comparative clinical results and observations made in this way showed no striking differences in most respects between the two groups. There was no appreciable or significant variation in the amount of abdominal distention intestinal activity vomiting abdominal discomfort bowel activity bladder function or degree of hydration. The single most striking observation was the comparative comfort of the pitressin group. These cases showed very little discomfort either subjectively or objectively and except for 2 cases required no morphine or supplementary sedatives. One of these required morphine for a coincidental severe dysmenorrhea and the other for pleurisy. This result of the pitressin regime seemed consistent enough to practically exclude the psychic effect alone of repeated hypodermic medication.

As a result of these observations of the stimulating effect of pitressin on the bowel in human subjects and the comparative effectiveness of its clinical use in a group of cases of this

" In the milder and moderate degrees of ileus pitressin has been effective and of great value but it should be used with great care and it probably definitely contraindicated in the advanced degrees of ileus. The overdistended bowel with its much thinned out wall and its reduced circulation at the ante

DIVERTICULA OF THE GASTRO INTESTINAL TRACT

RICHARD G. WHITING

ALONG the entire course of the gastro intestinal tract diverticula may occur. In an individual case these are not uncommonly multiple in a certain region but may also be found at different levels of the same gut.

Except in certain specific types of diverticula the etiology is not clear. Many theories have been offered but none has been completely satisfactory. It would seem that there must be several factors any one of which may be more significant in a chosen case. Of most general etiologic significance however are the two facts that diverticula are more frequently found in older individuals and that most but not all diverticula originate near points of entry of blood vessels that is in a potentially weak spot. Of specific significance as either the chief or initial cause in the production of traction diverticula is the contraction of adhesions secondary to infection either in the wall of the gut or in adjacent structures.

At different levels in the esophagus separate types of diverticula occur. In the upper third is found the pulsion type a definite entity. It is a herniation of mucosa and submucosa bulging posteriorly at the pharyngo-esophageal juncture. Because without exception this sac points downward thereby forming a catch basin increasing size and increasing symptoms are readily explainable and the necessary mechanics of treatment become apparent.

At the stage where there is a mere dimpling in the esophageal wall symptoms are only those associated with the catching of small particles in the throat. When the sac becomes

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At the stage where there is a mere dimpling in the esophageal wall symptoms are only those associated with the catching of small particles in the throat. When the sac becomes

large enough to collect considerable material but not to obstruct, the chief complaint is of regurgitation of food taken at an earlier meal. Patients may be disturbed by a feeling of pressure causing dysphagia by foul breath, and by noises due to mixture of air and fluid in the diverticulum. In addition they may learn that by pressure on the neck or by assuming certain attitudes they secure relief, contents thereby regurgi-



Fig. 226.—Traction diverticulum in middle third of esophagus. For illustrations of esophageal pulsion diverticula see Figs. 163-165.

tated, contain no free hydrochloric acid. With increasing size and weight the diverticulum tends to hang straight down displacing the gullet laterally so that all food swallowed passes first into the sac. Progressive obstruction leads finally to real danger of starvation.

To differentiate from a benign or malignant obstruction arising from other causes and to determine the exact location of the hernia, x-ray examination with an opaque meal is necessary.

The treatment is surgical. It involves first the elevation and second the obliteration of the sac. It has been found that postoperative esophageal dilatation should be carried out every two or three months for a year. The operative technic in this procedure has been thoroughly described by Dr. Frank H. Lahey in Volume 13, Number 3, pages 525-540 of this publication.

In the middle third of the esophagus there may be found traction diverticula usually resulting from contracture of ad-

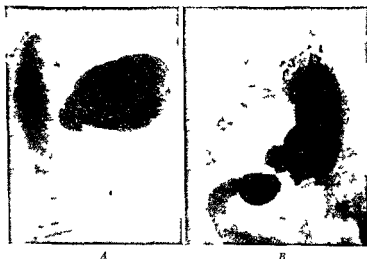


Fig. 227. Gastric diverticulum: symptomatology of peptic ulcer. A, Patient in Trendelenburg position to fill fundus; B, patient standing.

hesions produced by infection in the peribronchial nodes. Since the apex of such a diverticulum is likely to be at or above the level of its mouth and since its mouth tends to be wide, this lesion is commonly symptomless. Fortunately, since these diverticula occur within the chest cavity, no treatment except esophageal dilatation in an occasional case is necessary.

Either in association with the very rare peptic ulcer of the lower third of the esophagus or with the more common ulcers of the stomach and duodenum, traction diverticula may occur.

In any case, the fundamental lesion is the ulcer. Presence or absence of symptoms depends on the activity of that lesion. When discovered by x ray, treatment is limited to whatever is demanded for the particular ulcer or for its complications.

Very rare are diverticula of the stomach. Just below the cardia on the lesser curvature these outpocketings are said to be congenital. The lesions are more likely to be fundal and near the cardiac orifice. It is possible that these may be initiated by pulsion during vomiting and retching. Although these diverticula are again usually symptomless, cases have been reported of substernal burning associated with retention of gastric contents in these pockets. Hemorrhage may also occur. Surgical treatment of such lesions has been considered desirable but their location is likely to preclude this.

In the duodenum diverticula are secondary to some local infection such as cholecystitis and ulcer or more frequently occur along the lesser curvature without specific cause. Those in the latter group are without symptoms. Those in the first group present symptoms when there is inflammation or when pressure is exerted upon the duodenum, the bile or the pancreatic ducts. Symptoms therefore simulate those arising from these organs in more common conditions. Cases with intermittent colic and jaundice have been reported in which a diverticulum was found as the only explanation.

Diagnosis is by x ray. Treatment directed toward the sac is indicated only where the symptoms can be shown to be produced by the diverticulum per se. In such cases surgical intervention for dissection and excision of the sac is necessary. This may be difficult particularly if a peridiverticulitis has been present.

In the jejunum and ileum, except for Meckel's diverticulum, outpocketings are rare. Clinically they are not diagnosable but they are occasionally demonstrated during an x ray study or at the postmortem table.

In the terminal ileum may be found Meckel's diverticulum, a relic of the fetal vitelline duct. This congenital remnant is frequently not considered in a general discussion of diverticula.

However like most diverticula it is silent and of no clinical import until a pathological process starts. In the presence of infection symptoms appear very similar to those of an atypical appendicitis. Intussusception or the wedging of gut past the diverticulum and its terminal band initiate that train of complaints of pain distention and vomiting associated with intestinal obstruction. Not infrequently aberrant gastric and pancreatic tissue is contained in Meckel's diverticulum. Ul



Fig. 228.—Diverticula of duodenum and of first portion of jejunum.

ceration occurs and the two complications perforation or hemorrhage are possible. The treatment of a pathological Meckel's diverticulum is excision. Since the diagnosis may sometimes be confused prior to operation the exploration of the terminal ileum to determine the status of a possibly present Meckel's diverticulum is recognized as always a valuable procedure to be followed in any abdominal operation.

Of the entire gastro intestinal tract the colon chiefly in its distal portion is the commonest site of diverticula. In the

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Of the entire gastro intestinal tract the colon chiefly in its distal portion is the commonest site of diverticula. In the

absence of infection, freedom of symptoms is the rule, leaving diagnosis to be made incidentally during barium studies. The best visualization of these diverticula is found in the x-ray plate taken after the evacuation of an opaque enema.

Once infection occurs, the patient commonly has complaints. In an acute diverticulitis the earliest subjective evidence may be a crampy abdominal pain, first a bit generalized and later localizing usually in the left lower quadrant. Anorexia, nausea, and gas are likely complements. Although alternating constipation and diarrhea are common, constipa-



Fig 279—Diverticulosis and diverticulitis of colon. Arrow points to a regular constriction caused by diverticulitis. *A* Colon filled with barium enema. *B* colon after emptying showing multiple diverticula.

tion may be outstanding. In some cases this may amount to obstipation, and when this is accompanied by a palpable abdominal mass, the necessity of differentiation from carcinoma becomes essential. At the site of infection a constant irregularity is visualized by x-ray. Two findings help in the roentgen differentiation of this constriction. The demonstration of adjacent diverticula points toward the benign character of the obstruction but of course does not rule out carcinoma.

distal to the constricted portion. In infection the extent of involved tissue is more likely to be irregular and the adjacent gut to be contracted by spasm.

If the patient is acutely and seriously ill with either complete obstruction or evidence of perforation, immediate operation must be undertaken. Even with the abdomen open it may not be certain as to whether the inflammatory mass contains malignancy and the final decision will rest with the pathologist.



Fig. 230—Carcinoma of sigmoid which has extended to involve adjacent distal coil of sigmoid. Arrow indicates ballooning of gut at edge of lesion.

If immediate operation is not demanded it is far safer and wiser to allow a two weeks' trial of medical therapy. At the end of this time a second barium enema must be done to determine whether any change has occurred. If the case is one of diverticulitis considerable x-ray improvement is usually observable and the abdominal mass may well have subsided to an appreciable extent.

In the above case and in those of mild diverticulitis or diverticulosis the soundest method of therapy appears to be that in which a normal fecal current is produced and main-

tained with as little interference as possible. At the Lahey Clinic laxatives of any nature have been avoided both to prevent even the mildest additional irritation and stimulus to peristalsis and to avoid the filling of the diverticula of the sigmoid with liquid feces high in bacteria, hurried on too quickly from the small intestine. It is equally important to prevent too prolonged dehydration of the feces and the formation of inspissated material in the diverticula.

By prescribing a bland diet with varying amounts of cooked fruit and by the frequent drinking of hot water, a daily soft formed stool has been usually obtainable in all cases. When first started on this regime, patients are placed at bed rest. Frequent rectal examinations are done to foresee and to prevent the possibility of impaction. If the patient fails to empty a full rectum he is given a small warm oil enema. This is usually adequate to produce a defecation and prevent impaction. As the patient becomes adjusted to the regime oil is only rarely needed.

Under such management at the Lahey Clinic diverticulitis has been seen to subside and infection in uncomplicated cases has not been known to develop.

Summary—A general review of diverticula of the gastrointestinal tract has been presented.

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THE SURGICAL MANAGEMENT OF FECAL FISTULA

SAMUEL F MARSHALL

THE occurrence of persistent fecal fistulae of the abdomen is not very common and it is fortunate that this is true because the surgical cure of these fistulae may present many serious and difficult technical problems. During the past year at the Lahey Clinic we have observed and successfully treated 6 cases of fecal fistulae without serious complications arising in any of the cases.

We may describe a fecal fistula as an artificial communication or tract existing between the bowel and the skin through which only a small part of the fecal stream escapes in contrast to a colostomy or to any type of enterostomy which has purposely been established for drainage of the intestinal contents.

Fecal fistula most commonly involves the ileum or the cecum and ordinarily follows sloughing of the cecal wall or perforation of the lower end of the ileum as the result of severe infection or is produced by trauma during an operation. When a fistula arises from the cecum it is usually due to gangrenous sloughing of the inflamed bowel wall caused by a direct extension of the infection from a markedly inflamed or gangrenous appendix and the great majority of fecal fistulae probably have such an origin. Where a fistula communicates with the ileum it most frequently follows a secondary operation for a pelvic abscess or an operation for an intestinal obstruction due to adhesions and case report IV in this paper well illustrates this method of formation.

Very frequently a fecal concretion or an unremoved appendix may be the cause of a persistent sinus of the abdominal

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THE occurrence of persistent fecal fistulae of the abdomen is not very common and it is fortunate that this is true because the surgical cure of these fistulae may present many serious and difficult technical problems. During the past year at the Lahey Clinic we have observed and successfully treated 6 cases of fecal fistulae without serious complications arising in any of the cases.

We may describe a fecal fistula as an artificial communication or tract existing between the bowel and the skin through which only a small part of the fecal stream escapes in contrast to a colostomy or to any type of enterostomy which has purposely been established for drainage of the intestinal contents.

Fecal fistula most commonly involves the ileum or the cecum and ordinarily follows sloughing of the cecal wall or perforation of the lower end of the ileum as the result of severe infection or is produced by trauma during an operation. When a fistula arises from the cecum it is usually due to gangrenous sloughing of the inflamed bowel wall caused by a direct extension of the infection from a markedly inflamed or gangrenous appendix and the great majority of fecal fistulae probably have such an origin. Where a fistula communicates with the ileum it most frequently follows a secondary operation for a pelvic abscess or an operation for an intestinal obstruction due to adhesions and case report IV in this paper well illustrates this method of formation.

Very frequently a fecal concretion or an unremoved appendix may be the cause of a persistent sinus of the abdominal

wall. It is not uncommon for a surgeon operating upon a patient for appendicitis with perforation to remove a fecalith which has escaped from the lumen of the appendix and occasionally such an extruded fecal concretion may be allowed to remain unintentionally in the abdominal cavity. Although a fecalith free in the abdominal cavity may cause a draining sinus to persist for a long time, this is not a true fecal fistula unless there can be demonstrated a communication with the intestinal lumen. A foreign body of this nature may and frequently is eventually discharged without operation, following which healing will take place. Occasionally, however, operation must be undertaken for its removal.

It is not uncommon to find a persistent fecal fistula developing from a perforated ileum consequent to a severe grade of regional ileitis and with an increasing recognition of this disease entity one must always consider such pathology as a possible explanation of the cause of a fistula and plan the technical procedure accordingly. Case report III is an excellent example of how a fistula may result from such an inflammatory process. We have recently treated a patient who developed a small bowel obstruction and at operation the obstruction was found to be caused by an extensive regional ileitis which had also perforated into the sigmoid with the development of four fistulous tracts entering the sigmoid. It is always possible for a perforation in regional ileitis to occur into adjacent loops of bowel and not produce an external fistulous opening.

Occasionally a fecal fistula may result from an improper or incomplete closing of an enterostomy opening which may have been established as a temporary artificial anus as in the Mikulicz type of resection of the large bowel. This is most often due to an obstruction to the passage of the intestinal contents caused by an incomplete division of the Mikulicz spur. This is a technical error and should occur infrequently. With a considerable experience in the employment of the Mikulicz type of resection in this clinic we have rarely seen such a fistula persist. There occasionally may be a slight dis-

charge of fecal material from the wound for a brief period but spontaneous closure of the fistula usually takes place. Dr Lahey has in a previous paper¹ described the technic for closure of an enterostomy and in this clinic the employment of this method has proved most satisfactory. The incidence of persistent fistula has been practically nil following colostomy closure.

Partial obstruction of the small bowel produced by scarring about the fistulous opening in the intestine or in the segment of bowel distal to the fistula may account for the persistence of many of these tracts. At operation the surgeon should examine the intestine to determine if obstruction exists and if present it must be corrected by a resection of the segment or by some type of short circuiting operation in addition to a complete resection of the sinus. Most fecal fistulae tend to close spontaneously by granulation tissue and remain permanently healed unless obstruction is present. By far the largest number of these fistulae do not require surgery and it is the exceptional case that comes to operation. Operation in the cases that do not close spontaneously often demands most painstaking dissections and calls for the highest degree of surgical judgment and skill.

One of the most difficult problems arising in the surgical management of fecal fistulae has to do with the prevention of infection or peritonitis because the surrounding tissues cannot be satisfactorily sterilized. The surgeon must decide early as to whether an extraperitoneal method can be applied or whether the operation requires a transperitoneal approach. In the majority of the cases the abdominal cavity needs to be opened widely by free incision obtaining good exposure and protecting the unaffected viscera with abdominal pads. If the fistulous tract does not penetrate deeply into the abdominal cavity, it may possibly be removed without entering the general peritoneal cavity. This however is not the usual condition. It will be evident that small intestinal fistulae do not lend themselves to extraperitoneal closure and failure will usually follow

¹Surg. Gynec. and Obstet. June 1932 p. 923

employment of such a method. With deep pelvic fistulae or with fistulae densely adherent to the viscera or with fistulae having long tortuous tracts it is necessary to employ the transperitoneal method. Fortunately local immunity established by long standing peritoneal infection comes to the surgeon's aid and these wounds readily withstand contamination and tend to heal kindly. Furthermore, patients who have suffered from long standing infection appear to develop great resisting power and peritonitis rarely results if pains are taken to avoid unnecessary or gross contamination.

Simple short circuiting operations around the fistula without removing the tract are of little avail because reverse peristalsis will cause the fistula to continue to drain and one must plan complete eradication of the tract to bring about a successful outcome. It is essential to excise the portion of the bowel wall which is thickened, indurated and irregular in order to obtain satisfactory closure and one must close this opening in the bowel in such a manner as to prevent such narrowing of the intestinal lumen as would result in intestinal obstruction. If it appears that the excision of the bowel wall is so extensive that the opening could not be safely closed a resection of the segment must be carried out with the continuity of the bowel restored by a lateral anastomosis. We prefer a lateral anastomosis because the proximal loop is apt to be disproportionately increased in size which will not permit a safe end-to-end anastomosis with a distal loop often reduced in size.

The large majority of these fistulous tracts will require considerable operative ingenuity to obtain a closure and no single method can safely be employed for all of them. The operative technic must be planned for each individual case and very often the details of the procedure can only be determined at the time the pathology is demonstrated and as the operation progresses step by step. It is important to attempt to visualize beforehand the type of pathology that one may expect to encounter and an analysis of a detailed and accurate history together with a careful examination of the patient will very often assist the surgeon in reconstructing the whole pic-

ture and enable him to outline readily the method of surgical approach. We have found that x ray examinations made following the injection of an opaque liquid are of real value in only the occasional case. The history and the examination are much more reliable in determining the source of the fistula. Perhaps the method of surgical management can best be illustrated by citing several cases with descriptions of the operative method employed for each case.

Case I—E E a white male fifty four years of age was referred by Dr W C Emery of Dorchester Mass for treat

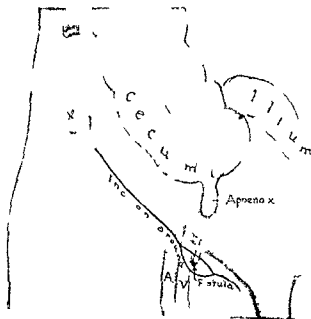


Fig 231 Shows the location of the fistulous opening and the incision used in the operation. The relation of the cecum and the appendix to fistulous tract is also illustrated.

ment of a fecal fistula of the right lower quadrant of the abdomen present for one year entered the New England Deaconess Hospital on December 1 1936

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A probe was placed in the sinus as a guide and the tract dissected free from the femoral vein up to the femoral ring (Fig 233). An incision was then made above the inguinal liga-

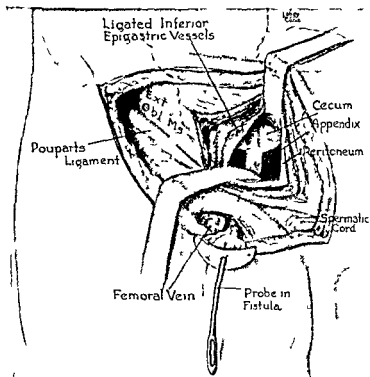


Fig 233.—The operative dissection is illustrated. The tract has been cleanly dissected from the femoral vein and is shown entering the stump of the appendix. Adequate exposure of the appendix and cecum is obtained by incising the fibers of the aponeurosis of the external oblique and retracting the internal oblique and transversalis muscles. The peritoneum is opened but the operation is extraperitoneal because adhesions adequately protect the general peritoneal cavity.

ment through the aponeurosis of the external oblique muscle, retracting the internal oblique and the transversalis muscles and opening the peritoneum. The deep epigastric vessels were

History—Femoral hernia on right side was repaired in 1922, in 1927 he developed an abscess in the hernia scar, which opened and drained for seven weeks, completely healing after the discharge of a fecalith. In 1934, he was operated upon for a gangrenous appendix, which was drained only, at this time the femoral hernia scar again opened and drained purulent material, with both wounds healing after ten weeks. A fecal fistula opening developed in the femoral hernia scar about a year before admission to the clinic.



Fig. 232—x Ray film following lipiodol injection. The catheter is still in place and there is a pool of lipiodol in the cecum.

Examination—The patient was a well developed man, 185 pounds in weight, in excellent health except for a draining fecal fistula. Abdominal examination showed a right rectus scar in the lower abdomen and an oblique scar just below Poupart's ligament, with a draining fistula in center of scar (Fig. 231). x Ray examination following lipiodol injection showed a large sinus, apparently connected with the large bowel (Fig. 232).

Operation—Performed by Dr. S. F. Marshall on December 3, 1936. An oblique incision was made parallel to and below Poupart's ligament encircling the fistulous opening in the skin.

was opened through a right paramedian incision (Fig 234) and the terminal ileum 6 inches from the ileocecal valve, was found to be adherent upon its antimesenteric border to a femoral hernia sac. The fistulous tract was found to enter the bowel and was excised from the intestinal wall. The opening

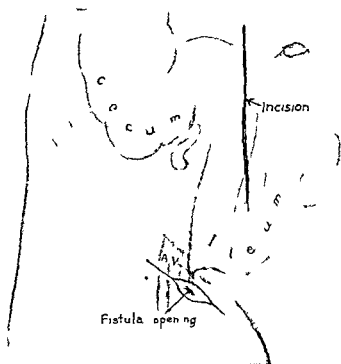


Fig 234—Shows fistulous tract entering terminal ileum through femoral canal. The locations of the incisions are illustrated. This fistula followed a Richter's hernia of the small bowel.

into the ileum was closed transversely and the lumen was not narrowed. The hernia was then repaired from within the abdominal cavity and the abdominal wall closed without drainage. An oblique incision was made below and parallel to Poupart's ligament, freeing the draining sinus from the femoral vein by careful dissection and entirely removing the whole

divided between ligatures for better exposure. The cecum with the appendix stump was easily identified and was found well walled off with adhesions from the general peritoneal cavity so that the latter was not opened into. The dissection of the tract was completed and the appendix which opened directly into the tract was removed, inverting the stump carefully. The femoral opening was then closed by suturing Poupart's ligament to Cooper's ligament. The muscles and fascia of the abdominal wall were closed in layers and a drain placed down to the femoral canal area. He was discharged twenty-three days postoperatively with only slight seropurulent drainage. Seen on February 27, 1937—wound was entirely healed.

Comment—This case illustrates a fecal fistula arising from an appendix and the history very accurately points to the appendix as the source of the fistula. In this patient we were able to excise the tract and close the opening in the cecum without opening the general peritoneal cavity, which materially reduced the operative hazard.

Case II—J. S., a white male aged forty-four years, entered the New England Deaconess Hospital on February 27, 1937.

History—At the age of seven years patient was quite ill following the development and drainage of an abscess in right inguinal region. Sinus drained for a long time and finally healed. No further trouble since that illness except that he was aware of the presence of a hernia in the right groin. One week before admission he developed tenderness and induration in the groin which opened and drained fecal contents.

Examination—General physical examination negative except for a draining fecal fistula opening over the femoral canal just below Poupart's ligament. Palpation revealed the presence of a femoral hernia and gurgling of intestinal contents beneath skin was easily demonstrated. A diagnosis was made of a fecal fistula probably arising from a Richter's hernia of the small bowel.

Operation—Performed by Dr. R. B. Cattell. The abdomen

was opened through a right paramedian incision (Fig 234) and the terminal ileum, 6 inches from the ileocecal valve, was found to be adherent upon its antimesenteric border to a femoral hernia sac. The fistulous tract was found to enter the bowel and was excised from the intestinal wall. The opening

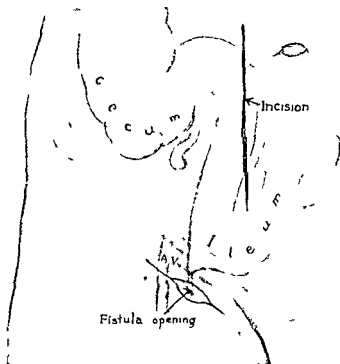


Fig 234—Shows fistulous tract entering terminal ileum through femoral canal. The locations of the incisions are illustrated. This fistula followed a Richter's hernia of the small bowel.

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fistulous tract This incision was closed with drainage Recovery was uneventful and he was discharged twenty-one days later with only a slight serous drainage from the inguinal incision

Comment —This case illustrates a transperitoneal approach to a fistula of the small bowel which arose from a Richter's hernia of the terminal ileum in a femoral hernial sac

Case III —H W a white male, aged twenty three was admitted to the New England Deaconess Hospital on September 12, 1936

History —He had had an appendix removed through a McBurney incision in December 1935, following which a fecal fistula developed and continued to drain until present admission to the New England Deaconess Hospital, immediately following his appendectomy according to his history, he developed an abdominal abscess which was drained through the same incision While in the hospital he further developed an intestinal obstruction and an anastomosis was made between the small bowel and transverse colon to relieve the obstruction All these operations had been performed before coming under our care His family had been advised that he had tuberculosis of the bowel and that the prognosis was extremely bad He continued to lose weight and suffered with diarrhea which occurred soon after each meal

Examination —This patient appeared ill was emaciated and had evidently lost considerable weight Chest was negative to examination and the rest of the physical check up revealed nothing except the presence of a draining fistulous tract in a low right McBurney scar There was also noted an upper abdominal right rectus scar An x ray made following lipiodol injection showed that the lipiodol passed readily into the small intestine (Fig 235)

Operation —Performed by Dr S F Marshall a right oblique muscle splitting incision excising the opening of the fistulous tract was made The opening of the fistula in the skin was closed with catgut to prevent pulling and the tract com

pletely dissected to find that it entered the cecum and also the ileum. The openings into the intestine were closed by an aseptic technic and the fistulous tract completely removed (Fig 236). The terminal ileum was considerably scarred and above the scarring the small bowel was hypertrophied and dilated. There was no evidence of active inflammation and nothing to suggest tuberculosis. Careful examination showed the previous enterocolostomy had been made very high and was between the lower



Fig. 235. x Ray of abdomen following lipodol injection into fistulous tract showing lipodol in small intestine.

end of the jejunum and the transverse colon. All of the ileum being distal to the anastomosis. The anastomosis was then taken down and the opening in the jejunum was closed transversely without narrowing its lumen. The ileum just proximal to the obstructed area was united to the transverse colostomy opening forming a new ileocolostomy. Convalescence was extremely uneventful and the patient was discharged on the twentieth postoperative day with both wounds healed and all gastrointestinal symptoms absent. Within six weeks he had

gained 38 pounds and although he had been an invalid for a year, within eight weeks had returned to his usual occupation of school teacher and when last seen was in excellent health and had gained 60 pounds in weight.

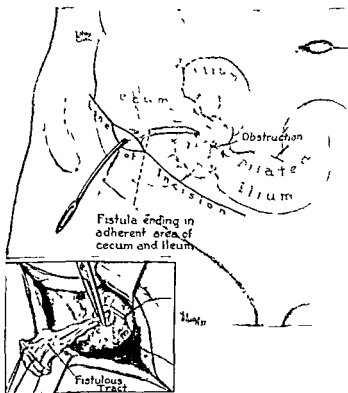


Fig 236—The method of dissection of the fistulous tract is portrayed and the technic of excising the sinus from the cecum is shown. The terminal ileum is contracted and scarred and the loop proximal to the scarred area is dilated due to obstruction.

Comment—It is evident that the pathology preceding the development of this fistula was a regional ileitis which terminated in perforation and later resulted in obstruction of the ileum. Regional ileitis is most commonly confused with tuber-

culosis and it was not unlikely that it would be diagnosed as such. However the picture is clear and the cicatricial stenosis of the terminal ileum at the last operation confirmed the impression clearly established by the history. The diarrhea is explained on the basis of an improperly executed enterocolotomy and with the restoration of the long loop of ileum to normal continuity all symptoms disappeared. It is significant that the microscopical examination of the fistulous tract showed chronic inflammation and not tuberculosis.

Case IV—M. C. a white female nullipara aged thirty six referred by Dr. G. W. Barbour of West Stewartstown, N. H. and entered the New England Deaconess Hospital on February 13, 1937.

History—For four years she had had a draining abdominal sinus. Abdominal operation in 1919 for tuberculous abscess in bed eight months and slow recovery. In 1933 operated upon for fibroid tumor and a second pelvic abscess drained following which operation patient again confined to bed for thirteen months. Abdominal fistula has persisted since that date. Undigested food would discharge from the fistula two to three hours after ingestion. Attacks of severe lower abdominal pain every one to three weeks followed by increased drainage from the fistula. Constipation always a marked feature.

Physical Examination—A fairly well nourished woman. Chest examination negative for tuberculosis and x-ray plate of chest also negative. Only significant findings were the presence of a discharging fecal fistula in the midportion of a suprapubic midline scar and a fixed adherent mass in the right side of the pelvis, this mass being adherent to a normal sized uterus.

Operation—Performed by Dr. S. F. Marshall. The midline suprapubic scar with its fistulous tract was excised and the peritoneum was opened. The pelvis was filled with adhesions and the sigmoid and rectum were densely adherent to the uterus. A firm fixed mass filled the right side of the pelvis and a probe passed through the fistula entered this mass. The

left tube and ovary had been previously removed. After a painstaking dissection a supravaginal hysterectomy was done also removing the right tube and ovary which comprised the mass on the right side. The fistula was found to enter the ileum which was scarred and partially obstructed. This fistula was excised and the intestinal opening closed but the closure produced so much narrowing of the bowel lumen that it was necessary to perform an ileocolostomy between the terminal ileum and the transverse colon. While it was considered undesirable because of the diagnosis of tuberculosis but because of the marked degree of secondary infection present a drain was introduced through the abdominal wound into the pelvis and removed within a few days. This patient made a most uneventful convalescence and was discharged twenty six days following operation with the abdominal wall well healed. Dr. Shields Warren reported the removed specimen to show tuberculous endometritis, tuberculous oophoritis and tuberculous salpingitis.

Comment -- This is an excellent example of a fistula following a secondary operation for drainage of a pelvic abscess probably resulting from marked inflammation involving the wall of the ileum. An extensive operation involving much difficult dissection was necessary to remove the involved pelvic organs and to excise completely the fistulous tracts. The closure of the small bowel together with an already existing partial obstruction necessitated an entero anastomosis to prevent the development of a serious postoperative complication.

These case reports emphasize that any possible likelihood of obstruction to the affected segment of the bowel should be carefully considered and provided for in order to avoid a serious hazard and possible fatal outcome. With such extensive surgery, serious complications must be anticipated and great attempt made to prevent their occurrence. Any complication of a serious nature could readily result in a fatality. The dissection of the fistula may be extremely difficult and require painstaking care to avoid injury to other structures. If it is at all possible to follow the fistulous tract one may close the

opening in the skin and proceed with the dissection of the closed tract, thus avoiding leaking and contamination. The course of the fistula can then be followed by traction on the dissected part of the fistulous tract or by the induration and thickening of its walls. Frequently however, a probe or grooved director must be inserted in the tract to enable the operator to locate its course. In our experience, even though working with contaminated tissue, postoperative infection has been mild and of little consequence and has presented no serious problem. One must however exercise every care to avoid unnecessary contamination. With meticulous attention to all of the technical details of such an operation we believe that one can confidently predict an excellent outcome in most of the cases, and promise a permanent eradication of the fecal fistula without undue risk to the patient.

COLECTOMY FOR INTRACTABLE ULCERATIVE COLITIS

RICHARD B. CATTELL

THERE is a small group of patients with chronic ulcerative colitis that cannot be treated successfully by conservative means. In the group of patients that we have observed surgical treatment has been felt necessary in approximately 20 per cent. We believe that operation will at times be necessary in the intractable cases due to the complications that occur. When ulcerative colitis leads to incapacity for increasing periods of time due to the infectious process itself surgery may be indicated. Perforation of the colon is the most frequent cause of death in these cases and if operative interference is delayed in the severe cases it will not be of avail in saving the patient's life. In the long standing cases the colon becomes so crippled by fibrous tissue that it can no longer function satisfactorily.

The operations of value in the treatment of intractable and chronic ulcerative colitis are ileostomy, partial colectomy and complete colectomy. Ileostomy when done sufficiently early may be a life saving procedure yet if delayed and performed as a last resort will have a prohibitively high mortality. With the complete diversion of the fecal stream by ileostomy the entire colon is given complete rest. In few cases this may result in arrest of the infectious process in the colon and no further operation would be indicated. Since the chronic ulcerative process usually begins in the lower bowel particularly in the rectum and spreads by direct continuity along the bowel it is possible in certain cases to interrupt the progression of the infection by complete division of the bowel and mesentery well above the infectious bowel. In these cases resection of

of ulcerative colitis involve the terminal ileum we believe that the ileostomy should be done at a site 6 or 8 inches proximal to the ileocecal valve. In those patients having high fever, malaise, prostration accompanying the acute phase of the disease, the usual type of double barrelled or loop ileostomy should be performed (Fig 237)

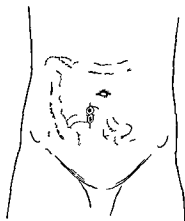


Fig 237



Fig 238

Fig 237—A diagram of the usual loop or double barrelled ileostomy. The continuity of the ileum is entirely interrupted. The ileostomy is performed through the right rectus muscle 2 inches below the umbilicus.

Fig 238—Diagram of a new divided ileostomy recommended by the author. The proximal ileum as the permanent ileostomy is placed in the right rectus at the same site as in Fig 237. The distal end is brought out through a stab wound at a higher position on the abdomen. This will be along the site of the incision for the first stage colectomy.

In those patients in somewhat better condition we employ a new type of ileostomy as shown in Fig 238. The ileum is divided between clamps bringing out the distal end to the right of the rectus muscle through a stab incision. The proximal loop of the ileum forms the permanent ileostomy and is brought out through the original incision through the right rectus muscle. The mesentery of the ileum is anchored to the peritoneum of the anterior abdominal wall to prevent later prolapse. This 'divided ileostomy' is done in those cases of

the colon and rectum distal to the divided colostomy has proved of definite relief in these earlier cases. Colostomy of the ordinary loop type will not interrupt the progression of the infection. There will be few patients in whom a partial colectomy can be expected to give relief and it is of course extremely difficult to estimate the extent of the process. Certainly it is impossible at the time of operation to determine the extent of the involved bowel by direct inspection or palpation of the colon. The only effective way of estimating the extent of colon involved is by sigmoidoscopic examination by barium enema and double contrast enema.

We believe that complete colectomy will be necessary in most cases of severe chronic ulcerative colitis if the disease is to be entirely eradicated. Likewise those cases which are severe enough to demand ileostomy who do not have a clinical remission as a result of the ileostomy should have later complete colectomy in stages. It has been our experience that it will be impossible to restore continuity of the ileum in these cases without having an exacerbation of the infection in the colon. Furthermore in those cases having ileostomy marked contraction of the colon is prone to occur in the absence of colonic function following this side tracking operation so that actual obstruction may follow the removal of the ileostomy.

Ileostomy is not an operation of great magnitude yet because of the poor condition of these patients requiring it the operative mortality may well be high. A tube ileostomy is of no value in the treatment of ulcerative colitis. Operation should be performed under local regional or cyclopropane anesthesia. No exploration of the abdomen should be attempted and it is particularly important not to palpate the colon or attempt to determine the extent of the process at the time of the ileostomy. Not only is abdominal exploration productive of shock but there is great danger of producing a widespread generalized peritonitis. It is of course extremely important to select a loop of ileum close to the ileocecal valve and sufficient handling of the small intestine will be necessary to make certain of its position in the ileum. Since 20 per cent of the acute cases

colon over to the middle colic artery can be removed. This is shown as segment *a* (Fig 239). In patients who have shown marked improvement after ileostomy in whom complete colectomy is felt necessary, all of the colon over to the descending colon and left colic artery may be removed. This is shown by segment *a* and *b* in Fig 239. In all cases the distal end of the colon is implanted in the abdominal wall since this provides a safety vent and avoids peritoneal infection. In some cases three stages may be necessary following ileostomy, segments *a*, *b*, *c* being removed in separate operations as shown in Fig 239. The second stage colectomy may consist of the abdomino-perineal resection of segment *c* or the entire left colon, rectum and anus as segments *b* and *c*.

If complete colectomy is carried out in stages directly dependent upon the condition of the patient, it can be done with safety even in these poor risk patients. The stage of colectomy should not be carried out for some months after ileostomy. Time should be allowed in order to evaluate the full value of the ileostomy for in a few cases removal of the colon will not be necessary. Furthermore patients should have time to gain as much general improvement as possible before carrying out the more serious stages of the colectomy. In some cases it may be necessary to do the first stage colectomy soon after the ileostomy as is shown in Case I. The time between the stages of the colectomy should not be less than two months and longer periods of time may be of benefit. The time of the later stages is elective since the blood supply is carefully preserved to the distal segments which are left. We have not found it feasible to leave a stump of rectum for later possible anastomosis of the ileum to the rectum since our cases have shown marked involvement of the rectum.

Two case reports follow which illustrate the management of the intractable cases of ulcerative colitis treated by complete colectomy.

Case I—A thirty two year old white female, was first seen at the clinic April 6 1934 complaining of diarrhea and indi-

severe chronic ulcerative colitis who are to have later complete colectomy in stages. The implanted distal loop comes out along the line of incision of the first stage of the colectomy and does not complicate the resection to the same extent that the ordinary double barrelled ileostomy does where it is necessary to deal with the distal ileum by inverting the stump. We are unwilling to follow the suggestion of Rankin that the distal

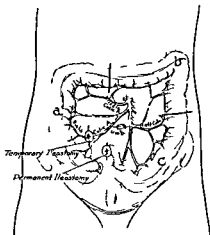


Fig. 239—A diagram of the colon with the arterial blood supply shown. The lines across the colon indicate the limit of the various stages of complete colectomy. *a* is carried out as the first stage in poor risk cases which leaves the middle colic artery intact to the distal bowel. *a* and *b* are resected as the first stage colectomy in the better risk cases. This preserves the left colic artery to the distal bowel. The second stage complete colectomy removes segment *c* as an abdominoperineal resection. *b* and *c* are sometimes combined as the second stage.

ileum in these cases be inverted and dropped into the abdomen because of the danger of stricture in the colon that may follow ileostomy.

It is extremely important to carry out complete colectomy in stages. If ileostomy is considered as a first stage the colon and rectum should be removed by two additional stages. Figure 239 shows the elective limits of colectomy. In poor risk cases the right colon and the portion of the transverse

twice, and eight months later was having but two partly formed bowel movements a day, her weight was then 97 pounds, and her red blood cell count was 3,450,000 hemoglobin 60 per cent. In January, 1935, she developed a sudden sharp pain in the lower right quadrant of her abdomen. She was nauseated but did not vomit. Examination showed a firm tender mass in the right lower quadrant. Barium enema showed a large filling defect in the lower pole of the cecum. The rest of the colon was smooth, lacked haustral markings, and showed definite narrowing in the transverse colon. At this time her hemoglobin was 44 per cent and the red blood cells 3,400,000.

On January 29, 1935, an ileostomy was performed. Clear fluid was found in the abdominal cavity, and a smooth, round mass, about the size of an orange was seen in the cecum. A loop of ileum about 8 inches from the ileocecal valve, was brought up and anchored in the right rectus incision with a catheter placed in the proximal loop, and a clamp left on the distal loop (Fig 237). Two weeks later, a lateral incision was made at the outer border of the right rectus muscle, the cecum freed, the distal segment of ileum divided between clamps and the proximal end inverted. The dissection was carried around to the upper portion of the descending colon, where the bowel was divided between clamps, bringing the distal stump out through a small left sided incision, and removing the cecum, ascending and transverse colon (Fig 239, segments *a* and *b*). The right-sided incision was closed, burying the stump of the distal ileum in the wound outside the peritoneal cavity. The patient did very well postoperatively, and at the time of her discharge, had no discomfort or distress, and was having semiformal movements through her ileostomy. Clinically she looked much improved. The microscopic report was chronic ulcerative colitis (Fig 240).

She returned in July of the same year for the second stage of her colectomy, having gained weight and feeling well. On July 31, 1935, a left rectus incision was made, and carried up around the implanted stump of the descending colon. There were no peritoneal adhesions, the small bowel appeared per-

and at that time she felt well, and happy, weighed 116 pounds, and ate anything she pleased. There was no irritation of the skin about the ileostomy. She wore an ileostomy bag which



Fig 241.—Case I. Second stage colectomy. Resected specimen of descending colon sigmoid rectum and anus. There is marked injection of mucosa, a few deeply punched out ulcers and marked fibrosis.

she changed twice daily. The stool was semiformed, she had 2 or 3 movements each morning and usually 2 later in the day.

Case II—A forty year-old white female was first seen at the clinic July 29, 1932, complaining of abdominal pain, with diarrhea, and blood and mucus in her stools. These complaints had been present off and on for the past fifteen years, and had not responded satisfactorily to any form of treatment. Four months previous to this visit, she had had an

fectly normal, and a one stage abdominoperineal resection of the descending colon sigmoid, and rectum performed (Fig 241) Because of the patient's plans to be married, the uterus was not used to cover the pelvic defect, and she was not



Fig 240—Case I First stage colectomy The resected specimen of

sterilized She made an uneventful convalescence and was discharged in good condition on her seventeenth postoperative day

This patient was seen eleven months after her operation

and at that time she felt well and happy, weighed 116 pounds, and ate anything she pleased. There was no irritation of the skin about the ileostomy. She wore an ileostomy bag which



Fig 241—Case I. Second stage colectomy. Resected specimen of descending colon, sigmoid, rectum and anus. There is marked injection of mucosa, a few deeply punched out ulcers and marked fibrosis.

she changed twice daily. The stool was semiformal, she had 2 or 3 movements each morning and usually 2 later in the day.

Case II—A forty year old white female was first seen at the clinic July 29, 1932, complaining of abdominal pain with diarrhea and blood and mucus in her stools. These complaints had been present off and on for the past fifteen years, and had not responded satisfactorily to any form of treatment. Four months previous to this visit, she had had an

ileostomy performed elsewhere, with little relief from diarrhea and bleeding but had improvement in her general condition. For the past four years she had had considerable abdominal pain particularly at the time of menstruation.

Physical examination showed a double-barrelled enterostomy in the right lower quadrant from which a slight amount of blood tinged feces was draining. There was tenderness in the left lower quadrant and in the left adnexal region. Proctoscopy showed a lividly red inflamed rectal mucosa which bled easily. Red cell count was 4 000 000 white blood cells were 8500. Barium enema revealed a markedly contracted rectum. The rest of the colon was not examined because of the pain it caused the patient.

Patient was placed on medical treatment with some diminution in the pain and bleeding. In October 1932 she had a chill and a sudden severe pain in the lower abdomen and vomited everything taken by mouth for two to three days. Finally she had a thick gray discharge from the rectum with relief of pain. Following this the pain improved somewhat but she continued to bleed and she was advised to come into the hospital for operation.

On January 11 1933 a left paramedian incision was made the terminal ileum divided between clamps the cecum ascending colon transverse colon and the descending colon down to the sigmoid were freed the blood supply ligated and the bowel resected. The stump of the distal ileum was implanted in the wound and the distal sigmoidal stump was implanted in the left side of the abdomen. Apart from some soreness in the left side of her abdomen associated with fever which gradually subsided and some irritation of the skin around the ileostomy patient had an uneventful convalescence and was discharged in good condition with the wound well healed. The microscopic report on the specimen removed at operation was partial to complete replacement of mucosa by scar tissue with

sterilizing the patient. This resection also was done through a left sided incision. The lumen of the specimen removed was very narrow, with a wall three to four times its usual thickness. The microscopic report was chronic ulcerative colitis. She had an uneventful convalescence and was discharged on her twentieth postoperative day much relieved. She continued to do well, gained weight and felt strong until October 10, 1933,

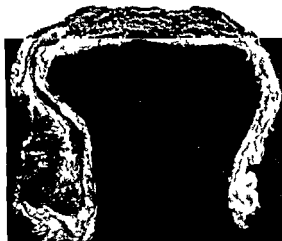


Fig. 242.—Case II. First stage complete colectomy: the open specimen consisting of cecum, transverse colon and descending colon. The mucosa has been almost completely replaced by fibrous tissue. There is a strictured area in the hepatic flexure and no lumen remains in portions of the descending colon. Due to marked fibrosis the colon retains its normal contour showing the positions of the hepatic and splenic flexures.

when she came in because of persistent vomiting of three days' duration with very little coming from the ileostomy. She was operated upon that same day and a complete obstruction of the small intestine due to a band of adhesions was found. This was released; she made an uneventful convalescence and was discharged on her thirteenth postoperative day in excellent condition. From this point on, she continued to do well, looked and felt well, and her weight which had been 150 pounds on

her first admission to the hospital increased so markedly (over 200 pounds), she was placed on a restricted caloric intake. At the present time, February, 1937, she weighs 197 pounds and is in excellent health.

From our experience with partial and complete colectomies for intractable ulcerative colitis, we believe that the disease can be eradicated by these operative procedures. Four patients having complete colectomy have been observed for a period of five years following operation. None have had any recurrence of fever, malaise, prostration or other clinical manifestations of the disease. These patients are able to carry on a normal activity after complete colectomy. The normal fluid consistence of the ileum changes as the ileum takes over the function of the colon. We have demonstrated dilatation of the lower end of the ileum in these cases, skin irritation around the ileostomy is unusual after removal of the colon. All patients must wear an ileostomy apparatus since they have an average of 5 stools daily. We firmly believe that these radical surgical measures are justified and necessary in the small percentage of patients with chronic ulcerative colitis that cannot be relieved by more conservative treatment.

CANCER OF THE DIGESTIVE TRACT IN THE YOUNG

SARA M. JORDAN AND DONALD T. CHAMBERLIN

It is now generally recognized that cancer of the digestive tract especially of the stomach and the rectosigmoid must be considered in ages considerably below what was once regarded as the cancer age. In early adolescence however it is fortunately still so rarely encountered that the case to be described has considerable interest both because of its rarity of occurrence and of the insidious history.

This case was a boy of thirteen years who came to the Lahey Clinic on January 5, 1937, whose only complaint was of diarrhea of twenty one months duration and of urinary frequency of two weeks duration. The diarrhea consisted of 4 to 5 watery stools daily containing blood and mucus. There was a history of a negative rectal examination at the beginning of his illness in 1935. The boy had not been incapacitated in any way and was carrying on a normal school life. His physical examination was generally negative except for slight pallor and for the presence on rectal examination of a firm cauliflower like mass about 10 cm. above the anal sphincter on the anterior wall. A barium enema revealed a narrowing of the rectum and a dilatation of the rest of the colon. The hemoglobin was 73 per cent, the count of red blood corpuscles 3,820,000 and of white blood corpuscles 4950. The free hydrochloric acid after an Ewald meal was 36. Two pre-operative biopsies of the rectal lesion were done both of which revealed a malignant adenoma and on January 13th a Miles resection of the rectum was performed by Dr. Lahey.

The extreme youth of the patient, the insidious development of the lesion, the fact that the presenting symptom of mild diarrhea was detected only by careful observation on the part of the boy's mother and was interpreted as indicating

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The extreme youth of the patient, the insidious development of the lesion, the fact that the presenting symptom of mild diarrhea was detected only by careful observation on the part of the boy's mother and was interpreted as indicating

only a mild colitis, are all clinical data of great interest and instructive value. The importance of two clinical precepts is emphasized by a consideration of this case.

1 That when symptoms persist, even though they are explained frequent reexaminations (in this case, rectal examination and barium enema) are a valuable procedure even though the original findings were negative.

2 That the rarity of a possible lesion, as in this case cancer in the adolescent, does not exclude its occurrence.

The interest of the authors was stimulated by this case and one of them (D. T. C.) studied the records of cases of carcinoma of the digestive tract in the Lahey Clinic, and in the literature, with the following results.

Of 1236 cases of carcinoma of the digestive tract presenting themselves at the Lahey Clinic between the years 1927 to 1936 inclusive, 41 or 3.4 per cent were individuals thirty-five years of age or younger. The diagnosis was confirmed by operation or biopsy, or both in all but 4 cases, and in these the x-ray evidence was thought to be conclusive. Nineteen were males and 22 were females.

The age, sex and location of the lesion were as follows.

Organ	Below 15		15-20		21-25		26-30		31-35		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
Pharynx							1				1	
Esophagus												
Stomach			1				1		4	5	4	2
Small intestine												
Cecum							1				1	
Ascending colon							1					1
Transverse colon									1	1	1	1
Descending colon												
Sigmoid					1		1		1	6	2	7
Rectum	1				3		1	3	5	3	10	6
Total	1		1	1	4		3	6	11	15	19	22

No cases of carcinoma of the esophagus, small intestine or descending colon were found. Only 1 case below the age of

fifteen was found—the case reported above. The case in the next age group was that of a girl of nineteen with epithelioid carcinoma of the stomach.

From there, the incidence rises sharply and consecutively to the thirty-one to thirty-five-year age group, of which 11 were males and 15 females. Four of the males had gastric lesions: 1 a lesion of the transverse colon, 1 of the sigmoid, and 5 had carcinoma of the rectum. The distribution of the lesions in the females was similar: 5 had carcinoma of the stomach, 1 of the transverse colon, 6 of the sigmoid and 3 of the rectum.

Osler and McCrae in 1900 said that in 150 cases of malignant disease of childhood, the incidence of gastric carcinoma was 4 per cent. These writers collected 6 cases of carcinoma of the stomach in the first decade of life and 13 in the second.

C. S. Hagerty and S. Gibson (1932)¹⁰ report a case of glandular carcinoma of the stomach with multiple liver metastases, in a boy age three.

Bishop (1934)¹¹ collected 16 cases of carcinoma of the stomach below the age of twenty, and reported a case of gelatinous adenocarcinoma of the stomach with generalized metastases and "Krukenberg tumor" of ovaries in a girl of sixteen.

Marble (1931)¹² reported a case of carcinoma of the stomach in a girl of seventeen, and quotes Sullivan (1924), who collected 25 cases in the first two and one half decades, of which 21 were in the first twenty years. This author did not include 13 of Osler and McCrae's list.

With a few other cases, Marble presents a total of 38 in the first two decades of life.

In 1923, Phifer,¹³ in a careful search of the literature, found 49 cases of carcinoma of the rectum and sigmoid in patients under twenty. Only 17 had biopsies.

Wainwright (1925)¹⁴ states that at that time, there were only 7 case reports of carcinoma of the colon above the sigmoid in children under fifteen. He added a report of a case of carcinoma of the splenic flexure in a child of five.

Shedden (1933),¹⁵ in an excellent review of the literature,

collected 36 proved cases of carcinoma of the sigmoid and rectum in individuals under twenty, of which 22 were males and 14 females. The age incidence of his series was as follows

Age	No. of cases.
9	2
10	0
11	2
12	4
13	1
14	2
15	5
16	4
17	5
18	4
19	7
20	0

The age incidence in a group between twenty and thirty five of 18 males and 8 females was as follows

Age	No. of cases
23	2
24	0
25	1
26	1
27	2
28	2
29	1
30	4
31	0
32	4
33	4
34	3
35	2

Raiford and Buttles (1933)⁸ report a case of primary mucoid carcinoma of the rectum in a girl of thirteen and state that in a review of all the cases of colloid carcinoma of the rectum none of the primary mucoid carcinomata occurred in patients under forty

Rosenberg (1934)¹⁶ studied the cases of carcinoma at the Pathological Institute of Munich from 1910 to 1933. Of 4048 cases of carcinoma 89 were under thirty and of these 42 were of the digestive tract. The incidence and age groups were as follows

Organ	Below 15		16-20		21-25		26-30		Total
	M	F	M	F	M	F	M	F	
Stomach			1	1	1	4	5	11	23
Papilla of Vater						1			1
C. lon			1	1	1		1	1	5
Sigmoid			1			2		3	6
Rectum			1		1	1	1	3	7

Walker and Daly (1934)¹⁷ quote Ullhorn (1925) as having collected 69 cases of carcinoma of the rectum in children below the age of fifteen, and Clar (1885) a case of carcinoma of the sigmoid in a boy of three and one half, and Dunkin (1885) a carcinoma of the terminal ileum in a boy of three and one half. They report a case of carcinoma of the rectum in a boy of five.

Pheiffer and Wood (1935)¹⁸ report a case of carcinoma of the transverse colon in a boy of seven. They collected 11 cases of carcinoma above the sigmoid in children under fifteen years. They quote Philipp (1907) as saying that 28 per cent of 93 cases of malignant disease in children affects the intestinal tract, and Schwamoni (1924) as having autopsied 2500 children in the first decade of life without finding a single case of carcinoma, and Matzen (1927) as having found 17 cases of carcinoma in individuals under twenty, in 8054 cases of carcinoma.

Isolated case reports in the recent literature are as follows:

F. E. Muller¹⁹—a case of carcinoma of the stomach in a girl of sixteen.

Levene²⁰—a case of carcinoma of the stomach in a girl of nineteen.

Wakely²¹—a case of carcinoma of the cecum in a boy of sixteen.

D. Smith²²—a case of carcinoma of the rectum in a boy of eleven.

P. Desai²³—a case of anorectal adenocarcinoma in a child of thirteen.

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Rosenberg (1934)⁹ studied the cases of carcinoma at the Pathological Institute of Munich from 1910 to 1933. Of 4043 cases of carcinoma 89 were under thirty and of these 42 were of the digestive tract. The incidence and age groups were as follows

Organ	Below 15		16-20		21-25		26-30		Total
	M	F	M	F	M	F	M	F	
Stomach			1	1	1	4	5	11	23
Papilla of Vater						1			1
Colon			1	1	1		1	1	5
Sigmoid			1			2		3	6
Rectum			1		1	1	1	3	7

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P. Desai²³—a case of anorectal adenocarcinoma in a child of thirteen.

T C Lawson³—a case of carcinoma of the rectum in a boy of seventeen

J Bottin²—a case of primary carcinoma of the rectum in a girl of nineteen

R F Ogilvie¹—a case of carcinoma of the cecum in a boy of thirteen

F Pouzet⁷—a case of carcinoma of the ascending colon in a boy of fourteen

Netto⁹—a case of adenocarcinoma of the colon in a girl of ten

SUMMARY

1 A study of 41 cases of carcinoma of the digestive tract in the young is made and a summary of the recent literature given

2 Carcinoma of the digestive tract occurs, although in rare incidence, below the age of twenty five, and the incidence rises sharply as age increases

3 One case report is given

4 A search of the literature reveals 138 cases of carcinoma of the digestive tract occurring in individuals below the age of thirty five, which with our cases make 179 reported to date

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CARCINOMA OF THE RECTUM

RICHARD B. CATTELL

CARCINOMA of the rectum is found more frequently in this clinic than any other malignancy throughout the gastro intestinal tract. This does not represent the true ratio between carcinoma of the rectum and carcinoma of the stomach since the latter is more common in the reported experience of other clinics. We have now had the experience of dealing with well over 300 cases of carcinoma of the rectum while during the same period 291 patients with carcinoma of the stomach have been seen. In our series of cases of carcinoma of the colon and rectum approximately 55 per cent have been found in the rectum while an additional 20 to 25 per cent occurred in the sigmoid. It seems quite important to call attention to the occurrence of carcinoma of the rectum in young adults. Sixteen per cent of our cases occur in patients under forty years of age and we have recently operated upon a boy twelve years of age with cancer of the rectum. The majority of these lesions come during the so called cancer age in the fifth and sixth decades yet 10 per cent of the patients are sixty five years of age or more.

We wish to present our experience in the treatment of cancer of the rectum during the year 1935 since this will be representative of the results of treatment in patients with this lesion during recent years.

During 1935 58 patients were found to have carcinoma of the rectum. Forty three were considered operable or at least it was felt that in this number resection was justified and would be of benefit. Fifteen were considered inoperable. At the

time of first examination 3 of the 15 were demonstrated to have generalized abdominal and liver metastases and no operation was performed. One patient had only laparotomy and because of extensive liver metastases without obstruction no further operative procedure was done. Biopsy of the rectum was done in 1 patient seventy three years of age who was shown to have Hodgkin's disease of the rectum he was treated by extensive x ray therapy. In 10 patients loop colostomy was done because of obstruction or impending obstruction. This group of 15 patients 5 without operation and 12 having palliative operation represents 26 per cent of the group under consideration who were deemed inoperable. Forty three patients or 74 per cent of all patients seen with carcinoma of the rectum were submitted to resection. It should be stated that in this group 2 of the patients who were considered operable died following colostomy so that 41 resections were actually completed. While we term these 43 patients (74 per cent) operable as previously reported by the author in another series of cases only one half the resected cases are reasonably favorable. The other half of the resectable or operable cases are unfavorable because of local extension of the growth involving other pelvic structures local and distant glandular metastases peritoneal involvement and because of small liver metastases. We feel that resection with removal of the primary growth is justified where the technical difficulties of resection are not too great when the patient's condition seems reasonable and when an expectancy of life of a year or more is present. It must be stated that this latter qualification cannot be answered accurately and for this reason there is considerable difference of opinion in regard to the advisability of resection in these extensive cases. This matter must be decided by the surgeon's own experience and judgment both as regards the operative difficulties that may be present and the life expectancy in previous palliative resections.

We do not believe that any one type of operation for carcinoma of the rectum is adaptable to all cases. We prefer the abdominoperineal resection in either one or two stages in

all patients with carcinoma of the rectum and performed an abdominoperineal resection in 31 patients or 80 per cent of this series. Abdominoperineal resection in one stage was carried out in 7 patients (16.3 per cent). 27 or 63 per cent of the abdominoperineal resections were done by the two stage technique described by Dr. Lahey. An additional patient had a loop colostomy and subsequent abdominoperineal resection similar to the earlier method described by Mayo. Three patients were operated upon abdominally with anterior or abdominal resection in one stage. Five patients were considered to be too poor risks to have more than loop colostomy and subsequent perineal or posterior resection (11.6 per cent). The use of these operations in the treatment of carcinoma of the rectum is fairly representative of the methods employed during the past few years. We have gradually increased the number of one stage abdominoperineal resections but it is our feeling that not over 25 per cent of these cases should be submitted to this operation.

The operative mortality following radical resection of the rectum for carcinoma will always be fairly high. In the group of 41 resections during 1935 there were 5 deaths, an operative mortality of 12.2 per cent. Two additional patients who were considered to be operable died following a first stage Lahey resection and should be considered in the mortality although they were not submitted to resection. This would raise the operative mortality for the cases selected for possible resection to 16.3 per cent. During the past seven years our mortality for resections of the rectum for carcinoma has remained between 9 per cent and 16 per cent.

In considering the 15 inoperable cases 10 had loop colostomy performed with 4 deaths. Extensive malignancy and long standing obstruction in these cases were responsible for the high operative mortality after colostomy only (40 per cent). It is interesting to contrast the mortality following palliative operation with that of the resected cases although this is not a just comparison. It is our belief that the mor-

tality following palliative operation will always be higher than the resection mortality

The causes of death following operation for resection of the rectum have changed a great deal in our experience in the past ten years. Peritonitis, surgical shock and pulmonary complications were the most frequent causes earlier in our experience. The pulmonary complications still are responsible for an occasional death, but all three of these causes have been fairly successfully eliminated in the later years of our experience. The causes of death in the 5 resection cases and the 2 having a first stage colostomy were as follows:

1. An anterior or abdominal resection was done in a man weighing 280 pounds, forty six years of age, who died nine weeks after resection because of wound separation and infection and septicemia.

2. A one-stage abdominoperineal resection performed in a man fifty six years of age was followed by death on the fifth day from paralytic ileus and pneumonia.

3. A one stage abdominoperineal resection was done in a man thirty eight years of age who was considered a good risk patient who had a normal convalescence for nineteen days followed by acute pyelonephritis with cortical abscesses of the kidney causing death five weeks after operation.

4. A woman sixty seven years of age died ten days after a two-stage abdominoperineal resection (Lahey) from uremia.

5. A two stage abdominoperineal resection performed on a man sixty four years of age who died three days postoperatively from myocardial failure.

6. A man sixty seven years of age died seven days after operation from uremia after a first stage colostomy (Lahey).

7. A woman forty eight years of age died on the fifteenth day following first stage colostomy from intestinal and pyloric obstruction.

It will be noted that 3 of these patients died from urinary complications. Postoperative urinary difficulties have been the commonest complications in recent years following resection.

of the rectum A discussion of this subject is presented elsewhere in this volume by Dr James B Hicks

The 4 deaths occurring after colostomy in operable cases were due to pulmonary embolus carcinomatosis pneumonia and abdominal disruption with cardiac failure associated with auricular fibrillation respectively

It is impossible to discuss the end results in this series operated upon as recently as 1935 Nevertheless the follow up information to date is quite interesting During the intervening one to two years there have been 6 subsequent deaths in the resected cases Five of these were due to definite recurrence or persistence of the growth One patient died as soon as four months after a two stage abdominoperineal resection Three died between eight and ten months after operation while a fifth patient died two years following abdominoperineal resection These deaths were all due to recurrent carcinoma of the rectum The sixth patient who was sixty five years of age when he was submitted to a loop colostomy and posterior resection died ten months after operation from coronary thrombosis Two additional patients now have recurrence in this resected group

A consideration of the operative mortality and subsequent deaths in this series of resections might make one discouraged with the treatment of cancer of the rectum but when it is realized that 30 patients of this group are alive and well without recurrence in this group of 43 patients even for this short period of time it should be encouraging From a consideration of earlier experience we can expect approximately one half of the resected cases to subsequently die of their malignancy It is of course impossible to list patients as cured following resection for carcinoma of the rectum even after the usually accepted five year period yet in our series of cases few patients have had a recurrence after this interval of five years

Summary.—The experience at the Lahey Clinic in the treatment of carcinoma of the rectum during 1935 has been presented The operability rate in 58 patients was 74 per cent

Forty one patients were submitted to resection, 80 per cent of which were abdominoperineal resections. The operative mortality in the operable group was 16.3 per cent. Thirty patients who have been submitted to resection of the rectum remained free of recurrence during the short period that they have been observed.

URINARY TRACT COMPLICATIONS FOLLOWING RADICAL RESECTION OF THE RECTOSIGMOID

JAMES B. HICKS

THE majority of both male and female patients who undergo radical abdominoperineal resection of the rectosigmoid develop some form of rather serious urinary tract complication. The most frequent postoperative complication encountered is urinary bladder retention lasting from a few to many days. As catheterization either at intervals or with an indwelling urethral catheter is of necessity resorted to in these patients over a long period of time urinary tract infections usually develop.

Pyelonephritis occurs not infrequently. Inasmuch as the prostate gland is almost always infected during the convalescent period and this infection is practically always resistant to treatment it is in the male patients that the most bothersome disorders occur. Young male patients with no evidence of urinary disturbance preoperatively in many instances develop bladder neck contracture following removal of the rectum. In elderly male patients with moderate or large degrees of prostatic hypertrophy who have not been previously inconvenienced by this condition after the operation developed complete or a large grade of urinary retention. This retention is apt to be lasting and may require operative intervention.

In female patients the immediate course during the first few days of convalescence is almost identical to that seen in males, that is urinary retention and pyelonephritis. The ultimate prognosis of females however is much better, due to the rare occurrence of bladder neck obstruction. Urological treatment other than catheterization, urethral dilatation and cystoscopic procedures is not required.

The cystoscopic findings in male patients are strikingly similar in all instances. As a rule the bladder floor sags. The

Forty one patients were submitted to resection 80 per cent of which were abdominoperineal resections. The operative mortality in the operable group was 16.3 per cent. Thirty patients who have been submitted to resection of the rectum remained free of recurrence during the short period that they have been observed.

operative retention. This was treated by constant catheter drainage for ten days and finally the patient was discharged July 22, 1933. Her postoperative course was marred by a pyelonephritis with intermittent fever, the urine cloudy with pus. She complained of terminal burning and frequency at the end of her stay. Her following treatment consisted of urethral dilatations three times, lavage of the kidneys one time. Her initial visit, August 8, to the clinic after operation revealed 30 to 40 white blood corpuscles per high power field. On the above regimen her urine was negative on September 11 and her urinary symptoms absent. She died March 5, 1935 from strangulation due to metastasis to the thyroid gland. No objective or subjective urinary symptoms were present at this time.

Case II—Mr. F. A., age thirty-two, entered the clinic January 4, 1929, complaining of constipation, diarrhea, tenesmus and rectal bleeding of one year's duration. No urinary symptoms were present. A large cauliflower mass was located at the top end of the index finger. A first-stage Lahey abdominoperineal operation was done on January 12, 1929. Subsequently a second stage was performed on January 31, 1929. Immediately on the day of operation complete retention ensued. This was treated by permanent catheter for ten days and patient discharged on February 23, 1929. At this time he complained of burning, frequency, pain on voiding and urethral discharge, but with no residual urine. The latter was hazy with pus. He was seen regularly up to August 28, 1930, gradually developing an increasing residual urine. The urine was loaded with pus and very foul. The residuum was now 12 ounces and a typical median bar was corrected with Young's punch. About 3 Gm. of tissue were removed and proved on pathological examination to be chronic inflammation. He was followed until the time of his death from metastasis on January 1, 1933. His urine at this time was clear, he was emptying his bladder completely and relieved of his vesical complaints.

trigone seems to be more or less stretched forming an angulation with the urethra at the level of the internal sphincter. This is almost the same cystoscopic picture as seen in moderate grades of cystocele. Muscular hypertrophy and trabeculation in most instances are absent. This bladder distortion is produced by the lack of support from the bowel following its removal. The vesical floor itself and its attached peritoneum being displaced posteriorly to fill the space occupied by the bowel normally. Possibly in addition to the anatomical distortion some of the nerves in the vesical plexus are injured or destroyed.

In female patients the cystoscopic findings may be a replica of those seen in the male as the uterus is at times partially retroverted to construct a pelvic floor.

The early treatment is the same in both sexes, as retention is the immediate complication encountered. Intermittent catheterization or constant drainage is employed until residual urine is reduced to a minimum. Urinary antiseptics are always administered. It is only when bothersome obstructive symptoms and infection persist after the patients are well along in their convalescence that the treatment differs. Many women may require full dilatation of the urethra with sounds. They seldom need any more extensive instrumental treatment for the present. A large group of both old and young men are compelled to undergo operative treatment for bladder neck obstruction who otherwise may never have had any need for such a course had they not undergone a rectal operation.

The following protocols may serve to illustrate the various types of patients encountered subsequent to removal of the rectum with their complications and the measures taken in relieving them.

Case I—Mrs. M. H. age thirty four entered the clinic June 28, 1933 complaining of rectal bleeding and pain on defecation of eight months duration. An ulcerating mass proving to be carcinoma was discovered by rectal examination to be located a finger's length up the rectum. A Miles resection was done on July 1, 1933. She developed immediate post

THE DIFFERENTIAL DIAGNOSIS OF RECTAL BLEEDING

LVERETT D KIEFER

RECTAL bleeding may signify either the simplest or the most serious diseases of the rectum and colon, therefore the differential diagnosis of the symptom is extremely important. The complaint of visible blood in the stools demands a thorough examination of the rectum and colon by means of digital palpation, proctoscopy and roentgen ray studies. Regardless of the age of the patient, the omission of any one of these methods is an error which may eventually lead to serious mistakes in diagnosis.

The digital examination of the rectum should be a part of every routine physical examination. It is mandatory in all cases of rectal bleeding, and since a large majority of the new growths of the rectum occur within the reach of the examining finger, a good share of the serious causes of bleeding will be detected by this examination alone.

Careful technic such as gentleness, the liberal use of lubricant and the avoidance of external tabs and perianal hair, will not only be appreciated by the patient but will make the diagnosis easier for the examiner. Different positions have certain advantages. The recumbent position with the knees drawn up, allows bimanual examination with one hand on the abdomen and a finger in the rectum. The knee chest position has the advantage of allowing the abdominal organs to fall away from the rectum and often permits a more satisfactory palpation of the upper rectum and rectosigmoid area. Unusual spasticity of the sphincter muscle or pain experienced by the patient as the finger is inserted should be noted, as they suggest painful lesions at or near the external sphincter. Tumors, irregu-

Case III—Mr F F W, age seventy three, entered the clinic August 20, 1935, complaining of bleeding and fulness of the rectum, of nine to ten months' duration. No urinary complaints were elicited. A cauliflower mass was found $1\frac{1}{2}$ inches in diameter at the tip end of the index finger. A first-stage Lahey abdominoperineal operation was performed August 27, 1935. A second stage was done September 11, 1935. He promptly developed complete retention following the latter procedure the day of operation. This was combated for twenty seven days by indwelling urethral catheter. The non protein nitrogen remained at a normal level on several occasions. Transurethral revision carried out October 8, 1935 on a grade 3 benignly hypertrophied prostate gland produced 20 Gm of tissue. He was discharged twenty four days later after an uneventful convalescence with no residual urine. Follow up on March 1, 1937 revealed his bladder empty after voiding and no subjective symptoms. He was working daily as a lawyer.

CONCLUSIONS

1 A large number of patients develop some serious urinary disturbance following removal of the rectum. This is encountered in both sexes.

2 These disturbances are most likely due to the anatomical distortion of the bladder and interference with its innervation producing retention and infection.

3 Female patients are corrected more easily than males as they require only minor instrumental treatment.

4 Young males develop a stubborn prostatitis which rapidly produces a contracture of the bladder neck requiring operative intervention.

5 Elderly male patients with symptomless prostatic enlargement are precipitated into prostatism necessitating immediate operative correction.

6 Since such a large group of patients who have radical removal of the rectum suffer with postoperative urinary tract

laxities strictures rigidity and thickening of the rectal wall are searched for by sweeping the examining finger along the inner surface throughout the entire circumference of the rectum. Lumps of hard feces should not be confused with tumors. Fecal masses may be distinguished by their compressibility or by their disappearance after a cleansing enema.

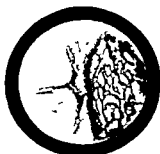
For the proctoscopic examination which includes anoscopy and sigmoidoscopy the author prefers to have the patient in the knee-chest position. If gentleness is employed an anesthetic is not necessary except for patients with painful lesions at the anus. It is usually preferable to make the examination without preliminary cleansing enemas or cathartics because after such preparation the rectum may contain fluid feces which continually obscure the field. A small amount of solid fecal material in the rectum usually does not interfere since the instrument can often be passed around it. A 9 inch sigmoidoscope with a bore of $\frac{7}{8}$ inch seems to be the most useful. A longer instrument is seldom of any additional advantage. With the anoscope the entire circumference of the anal canal should be inspected. Then the sigmoidoscope should be carefully introduced and as soon as the instrument has passed the sphincters the obturator should be removed and further introduction of the sigmoidoscope made only under direct vision. Failure to do this may result in severe injury or even perforation of the bowel wall. The inner surface of the rectum is inspected and particular attention should be given to the rectosigmoid juncture which is frequently too high to be satisfactorily examined by digital palpation and is the most difficult area to examine with the x ray. By inflating the rectum with air the instrument can usually be passed through the sphincter like rectosigmoid juncture into the sigmoid. In some patients more than the lower sigmoid cannot be examined due to fixation and acute angulation of the bowel at this point. In making the proctoscopic examination one should look for fissures hemorrhoids inflammation of the mucosa ulcerations openings of sinus tracts tumors strictures exudates and blood. The direct visualization of blood or exudate entering the rec-



1



2



3



4



5



6

Fig 243—Proctoscopic views of the interior of the rectum showing (1) a benign adenomatous polyp with a fairly broad base (2) a polypoid adenocarcinoma of the rectum, (3) a small flat cauliflower like carcinoma of the rectum, (4) irregular necrotic ulcerations of the rectum in amebic dysentery, (5) ulcerative colitis chronic stage with swollen irregularly scarred mucosa with multiple stellate hemorrhages and (6) ulcerative colitis in early acute stage showing diffuse hemorrhagic inflammation of entire mucosa

tumors and demonstrates the degree of flexibility of the bowel wall. The mucosal pattern frequently shows best in the empty film. Double contrast methods consisting of the distention of the bowel with an air enema after the barium has been expelled sometimes show lesions not visualized by other methods (Fig. 245).

Carcinoma of the rectum and colon, although not the most frequent, is the most important cause of rectal bleeding. It



Fig. 245—Double contrast enema (barium solution and air) showing a polypoid tumor of the rectosigmoid junction. Proctoscopy showed multiple polyps of the rectum. The colon was apparently free of tumors. Rectal bleeding was the only symptom.

is of unusual importance to the diagnostician because it is one of the forms of cancer most amenable to surgical treatment, providing the diagnosis is made in the early stages. Cancer of the rectum and large bowel may and frequently does occur in young people. There are several cases in the records of this clinic of carcinoma occurring in patients under the age of thirty. The youngest case was that of a boy aged twelve.

The symptomatology of carcinoma of the rectum is variable

tum from above has distinct diagnostic value, since it indicates an ulcerative lesion higher up in the bowel. If possible a sample of stool or exudate should be removed for laboratory examinations.

It is important to realize that the roentgenologic examination is often unreliable in the diagnosis of disease at or below the recto-sigmoid junction, but the barium enema is the most important method of direct examination of the bowel above the



Fig. 244—Typical constricting filling defect of the sigmoid caused by carcinoma. In this case the symptoms were abdominal pain, constipation, diarrhea and a small amount of blood in the stools. There was a small mass palpable in the left lower quadrant. The lesion was too high to be seen by sigmoidoscope.

reach of the sigmoidoscope. For the greatest diagnostic value the examination of the colon with the opaque enema should be done under direct fluoroscopic vision, with palpation of the bowel during the filling, and should include films taken before and after evacuation of the enema. A comparison of roentgenograms taken before and after evacuation of the enema serves to confirm abnormalities noted during the fluoroscopic examination, aids in distinguishing between fecal masses and

tum can be felt by digital examination as a firm fungating mass attached to the rectal wall, but some growths in the rectum and rectosigmoid are situated too high to be reached in this way. Some inflammatory lesions with perirectal induration are almost impossible to differentiate from carcinoma by the feel alone. The appearance of carcinoma as seen through the proctoscope is so characteristic that rarely should it be confusing. Carcinoma almost always occurs as a single lesion



Fig 247—Film after the enema shown in Fig 246 had been expelled showing failure to contract completely suggesting loss of flexibility and moth eaten appearance of the mucosal pattern characteristic of chronic ulcerative colitis

either in the form of an excavating ulcer or a proliferating mass. The most common appearance is that of a cauliflower like mass protruding into the lumen with a sloughing necrotic surface. The mucosa surrounding the lesion is characteristically normal in appearance.

The symptoms of carcinoma of the descending colon and sigmoid are associated with partial or complete obstruction of the intestine by the growth. Blood coming from lesions in

and unreliable in distinguishing this disease from other causes of rectal bleeding. Besides the presence of gross blood in the stools, the symptoms of cancer of the rectum include changes



Fig 246—Barium enema in a case of chronic ulcerative colitis showing contracted rectum and colon, absence of haustral markings, and fine irregularity of the outline of the bowel.

in bowel habit, diarrhea, constipation, tenesmus, rectal pain, and loss of weight. Frequently the loss of blood is the earliest symptom. In a large percentage of cases, cancer of the rec-

Chronic ulcerative colitis is an inflammatory disease of the lower bowel which, in nearly all cases, gives rise to loss of blood per rectum. The symptomatology of this disease varies within wide limits, depending upon the location and extensiveness of the inflammatory process, the presence of complications and the severity of the systemic manifestations. Usually there is diarrhea which may be severe, with pus and mucus as well as blood in the stools. In severe cases, the rectal discharges may consist entirely of this mucopurulent sanguineous exudate. Tenesmus and incontinence are not uncommon in this condition. In mild cases with the inflammation localized in the sigmoid, constipation instead of diarrhea may ensue. Fever, vomiting, prostration, anemia, dehydration and toxemia may or may not be present, depending upon the severity of the disease.

The digital examination of the rectum may reveal rectal strictures, or a small contracted rectum with a boggy mucosa. An increase in free bleeding induced by the examination suggests ulcerative colitis.

The proctoscopic examination is the most important procedure in the diagnosis of chronic ulcerative colitis. In only about 5 per cent of cases the lesions are localized at a point above the reach of the sigmoidoscope. In the severe cases extensive shaggy ulcerations and necrosis of the mucosa are seen so that the lining of the rectum literally hangs in shreds. However, the more usual picture seen through the proctoscope is a marked hyperemia and swelling of the mucous membrane, which frequently gives to the lower bowel the appearance of a narrow rigid tube. The entire surface is involved in the process so that there are no areas of normal mucosa seen. This is a valuable distinction between this disease and amebic colitis. A bloody mucopurulent exudate covering the bowel wall is a constant finding. When this is wiped away there is disclosed a roughened, irregular, dark red surface which bleeds freely from many small points. This tendency to bleed from the slightest touch is characteristic of the mucous membrane affected by ulcerative colitis.

this region is darker and is usually more thoroughly mixed with the stools. Changes in bowel habits, increasing constipation, recurring attacks of diarrhea, borborygmus, distention, visible peristalsis are symptoms and signs which have definite relationship with obstruction of more or less degree. Although lesions in the lower half of the sigmoid may be seen through the sigmoidoscope, the diagnosis depends largely upon the roentgenologic examination. Blood from lesions above the splenic flexure is usually so well digested that it rarely appears as gross blood in the stools except when there is profuse hemorrhage.

Polypoid adenomas of the rectum and large bowel frequently bleed and since adenomatous polypi have a marked tendency to become malignant, they are an important cause of loss of blood per rectum. Usually there is no symptom other than diarrhea and the appearance of blood in the stools, although in rare instances obstruction of the bowel occurs with the characteristic signs and symptoms. Polypi situated near the anus may prolapse and protrude from the anus. They are frequently multiple and may be found widely scattered through the colon and rectum. The localization of polypoid tumors is accomplished by careful rectal palpation and proctoscopic examination combined with thorough roentgenologic studies of the colon. The air enema is particularly valuable in visualizing these small nonobstructing tumors of the bowel wall. The differential diagnosis between benign adenoma and carcinoma is not easy. In the proctoscopic examination it will be seen that the mucosa covering the adenoma is more normal in appearance and shows less tendency to necrosis and ulceration. Malignant tumors on the whole have a broader base and are more fixed in position. Since there is such a marked tendency for adenomas to become malignant, the only safe procedure is to treat all tumors of this type 1 cm. or more in diameter as if they were already malignant. Certainly a biopsy should not be considered conclusive unless the entire tumor is removed along with a considerable portion of the mucosa which forms its base.

little difference between the appearance of the mucosa in this disease and the severe forms of ulceration seen in ulcerative colitis. Often scrapings taken from ulcerations in the rectum will show *Endamoeba histolytica* when they cannot be found in the stools.

The roentgenologic examination of the colon in amebic dysentery is valuable in determining the extent of the disease, but has little, if any value, in distinguishing the amebic colitis from chronic ulcerative colitis.

Tuberculous ulcerations in the rectum and colon, as well as the hyperplastic type of intestinal tuberculosis, may occasionally be found as a cause of loss of blood per rectum. The condition is exceedingly rare, except in patients with advanced pulmonary tuberculosis. Since in a large percentage of cases of intestinal tuberculosis, the lesions occur in the terminal ileum and the right half of the colon, undigested blood in the stools is not a frequent symptom of this disease. Tuberculous ulcerations in the descending colon, sigmoid and rectum are not common but do occur.

The appearance of tuberculous ulcers in the rectum as seen at proctoscopic examination has little that is characteristic or diagnostic. The ulcers resemble closely the ulceration caused by *Endamoeba histolytica* except that they are slightly more ragged in outline and the ameba cannot be demonstrated. The size of the ulcerations varies from 2 mm. to several centimeters in diameter. The hyperplastic type of tuberculous lesion is rarely encountered in the rectum. This type of lesion appears very similar to carcinoma and the differential diagnosis is difficult. Although the rectum may be involved in an extensive tuberculous process, there is an absence of fixation of the wall in the pelvis, contrary to the usual finding in extensive carcinoma. Finally, the distinction may be dependent upon a biopsy, in which case more than one piece of tissue should be examined for the biopsy to be conclusive. The presence of advanced tuberculosis elsewhere in the patient can be accepted as presumptive evidence that the lesions in the rectum are also tuberculous.

In the early stages of ulcerative colitis and in mild cases the x ray of the colon may show nothing more than evidence of marked irritability of the bowel. One of the earliest signs of true inflammation of the colon is the 'fingerprint' configuration of the outline of the bowel usually shown best in the film taken after the barium enema has been expelled. As the inflammation progresses thickening and loss of flexibility is demonstrated by the disappearance of haustrations and by the failure to contract after evacuation of the barium enema. In this condition the colon appears in the films as a shortened contracted, rigid tube. Characteristic irregularities in the mucosal pattern are frequently shown in the 'empty' film.

Amebic dysentery is a specific form of ulcerative colitis which causes bloody stools. Occasionally it may give rise to a large gross hemorrhage from the rectum. The diagnosis of amebic dysentery and its differentiation from other forms of ulcerative colitis is dependent upon the proctoscopic examination and the finding of *Amoeba histolytica* in the stools. The stools may be formed and blood streaked or watery with blood well mixed with the fecal material. There is usually less pus in the stools of amebic dysentery than in those of chronic ulcerative colitis. Repeated examinations of the stools may be necessary to demonstrate the amebae. Stools obtained after the administration of a saline cathartic have been found to give a higher percentage of positive examinations. Considerable experience in recognizing the pathogenic ameba is necessary in order to make reliable stool examinations.

The proctoscopic examination is highly diagnostic in this condition because of the characteristic lesions which occur in the rectum and sigmoid. The ulcers of amebic dysentery are more discrete, deeper and less numerous than those of ulcerative colitis. The mucosa between the ulcers may be reddened but is relatively uninvolved which is an important distinction from chronic ulcerative colitis in which condition the entire mucous membrane is uniformly involved in an inflammatory process. In the severe cases the ulcerations are large and confluent with much secondary infection so that there is very

cutaneous margin Slight stretching of the anal canal produces free bleeding

Prolapse of the rectum may result in bleeding if the mucosa of the prolapsed portion becomes traumatized

Among the less frequently encountered conditions which may be associated with rectal bleeding are severe food poisoning acute bacillary dysentery volvulus acute intussusception mercury poisoning foreign body in the rectum and hemorrhagic blood disease

In food poisoning and acute bacillary dysentery the loss of blood in the stools occurs from trauma of the mucosa from infection and severe diarrhea The bleeding as a symptom is overshadowed by the more outstanding systemic manifestations The history clinical course bacteriologic examinations of the stools and serologic tests serve to differentiate these conditions from other forms of ulcerative colitis

Volvulus and acute intussusception are acute abdominal conditions characterized by sudden pain shock and abdominal tumor Blood may sometimes be passed from the rectum in these conditions

Large doses of bichloride of mercury give rise to ulcerations and sloughing of the bowel mucosa A foreign body in the rectum may be suspected from the patient's history or may be found on examination

In hemorrhagic blood diseases the rectum is practically never the only site of blood loss Bleeding from other mucous surfaces is usually much more striking The diagnosis is established by suitable studies of the blood

Summary—The importance of rectal bleeding as a symptom has been discussed

The methods of examination required and the technical points involved have been outlined

The more important diseases giving rise to the symptom of rectal bleeding have been discussed and the differential diagnostic points have been emphasized

The roentgenologic examination is of value chiefly in the diagnosis of tuberculosis of the ileocecal region which rarely gives rise to rectal bleeding.

Hemorrhoids, including both the external and internal varieties constitute the most frequent cause of rectal bleeding. The blood is bright red in color and the bleeding occurs in association with the passage of a stool. If the stools are formed, the blood will be found in streaks on the surface of the stools. If the stools are loose the blood may appear to be mixed with the fecal material. Pain associated with the passage of formed stools may or may not be present. Protrusion of the hemorrhoidal masses is the most common sign and is usually noticed by the patient. Digital examination of the anal canal is useful in locating distended or thrombosed hemorrhoids but cannot be relied upon to detect hemorrhoids which are collapsed at the time of the examination. When the patient is examined while straining distended hemorrhoidal veins may be felt which are completely collapsed when the patient is in the knee chest position. Anoscopic examination is essential in order to form an accurate opinion of the extent of the hemorrhoids.

Although the sigmoidoscopic and roentgenologic examinations of the colon give no additional information about the hemorrhoids they are essential diagnostic procedures in order to rule out other pathologic conditions of the lower bowel. The most tragic errors in dealing with hemorrhoids consist of their treatment with failure to detect and consequent neglect of more serious coincidental disease of the rectum or colon.

Anal fissure is a frequent cause of bright blood on the stools. This condition is characterized by the marked pain and spasm at the anal sphincter. Formed stools are so painful that the patient resorts to catharsis in order to keep the stools liquid. Digital and proctoscopic examination of the rectum is frequently impossible without an anesthetic. Examination of the anal canal by means of the anoscope shows the fissure to be a shallow ulcerous lesion denuded of mucous membranes and nearly always located on the posterior wall near the muco-

PRURITUS ANI

NEIL W SWINTON

PRURITUS ani may vary from a local sense of irritation to an itching so severe that disability results. Although this condition, at least in its early stages is a symptom and not a disease entity, it is such a common rectal complaint and may be so distressing that an understanding of its etiology and treatment is important.

Pruritus ani is more common in men than in women. Blondes, people with delicate skin and obese individuals are most susceptible. Any condition causing constant local moisture tends to predispose to anal itching. Most cases of pruritus are found in people between twenty and fifty years of age although it may be present in children and in the aged.

The causes of pruritus ani may be divided into four groups.

1 *Anorectal Pathology*—Itching about the anus may be associated with any disease of the anus or rectum. Skin tags, hemorrhoids, fissures, ulcers, fistulae, abscesses, cryptitis, proctitis, polyps, and spastic conditions of the sphincter muscles, cause the majority of cases of pruritus ani.

2 *Systemic Disease*—Bowel dysfunctions and various diseases of the digestive tract, liver dysfunctions, anemia, diabetes, lues, nephritis, neuroses and others may be the cause of anal itching. Certain drugs, as morphine, atropine and quinine, may cause pruritus ani. Various allergic phenomena may be centered about the anus. Any disease of the genito urinary tract or pelvis may be the cause of anal itching. Vaginal discharges are among the common causes of this condition in our experience. Pruritus vulvae and ani in women at the menopause is common and there may be endocrine factors involved in certain cases. Excessive use of alcohol, tobacco, or other dietary indiscretions may result in pruritus.

in a vicious cycle is set up and the itching becomes worse and worse. Loss of rest and sleep result and the discomfort may be so intense that total disability is not uncommon in the severe cases of this disease. We have had one patient implore us to do an immediate colostomy rather than submit to any further days and nights of suffering from his pruritus.

In early cases of pruritus ani there may be no local changes in the skin although there is usually some congestion apparent. Following scratching abrasions and fissures develop and as a result of the secondary infection present a chronic dermatitis develops. In chronic cases the skin is thickened sodden in appearance the folds of skin radiating from the anus are accentuated deep fissures and cracks may be present and there may be excessive moisture present. In the long standing cases the skin may become thin pale and leathery and resemble kraurosis. The skin changes are usually most marked in the regions of the anterior and posterior raphes.

The diagnosis of pruritus ani is not difficult. A careful general physical examination should always be done together with the taking of a detailed history. The systemic and constitutional cases will be found in this manner. Blood Wassermann and urine examinations should be done routinely. Particular attention should be given the pelvis in women and the urinary tract in men. Referred pain from pathology in those regions is common. The skin about the anus should be carefully inspected and cultures taken for examination if scabies or *Trichophyton* infections suspected. Aid may be required from a competent dermatologist to differentiate the various skin lesions that may be present and we do not hesitate to ask for consultations in any of these cases in which there is any question as to the diagnosis. Anoscopic proctoscopic and if necessary sigmoidoscopic examinations should next be done to determine anorectal pathology. In the cases associated with diarrhea and rectal discharges smears should be taken to rule out amebic infections and when any abnormality of the gastro intestinal tract exists x ray studies of the bowel may be necessary.

The prognosis in pruritus ani should be guarded. Itching

3 *Skin Disease*—Lichen planus, seborrheic dermatitis psoriasis, eczema leukoderma and the parasites scabies and ringworm are among the more common skin diseases affecting the anus. In our experience we have found a very high percentage of cases due to ringworm infections. Many of these patients give a typical history of athlete's foot followed a few months later by a similar itch about the anus. Pinworms in children and certain other parasites in the crypts and folds of skin in the anal area may cause itching. There has been some evidence to show that certain streptococci *Streptococcus faecalis*, staphylococci and *Bacillus coli* may be factors in certain cases.

4 *Idiopathic Pruritus Ani*—This group of cases has been described in the literature many times and represents a group of cases of anal itching in which no local or general cause may be found. As we study our cases of pruritus more and more carefully and as our knowledge of the subject increases we are inclined to agree with Hirschman that in every case of pruritus ani there is or has been an etiological factor although it may at times be found only after the most careful study. Many cases of anal itching on first impression seem to fall into this group—healthy robust individuals with no apparent local pathology whose only complaint is an intense anal itching. Worry and nervousness explain many of these cases. Menopausal changes in women are associated with some. An obscure cryptitis or localized proctitis or an irritating vaginal discharge leaking down over the perineum may only be found after careful study. Certain obscure cases are associated with spasm or contracture of the sphincter muscles.

Pruritus ani begins usually as a mild itch or sense of irritation in the anal region. This itch is usually worse at night may be worse after exercise after bowel movements or when moisture is present. Changes in temperature may accentuate the condition. Local irritation from tight clothing increases the intensity of the local itching. As the discomfort becomes worse scratching and rubbing of the parts are resorted to by the individual in an attempt to relieve the condition. After continued scratching abrasions result secondary infection sets

attention should be given to local hygienic measures. The majority of cases of pruritus are caused by local, anorectal, pathology and such conditions should always be corrected. The removal of skin tags and simple dilatation or pectenotomy will relieve many cases of pruritus.

Local treatment varies with the condition of the skin. The majority of our patients obtain so much relief from hot sitz baths that we routinely advise their use twice daily when possible. The use of dilute solutions of potassium permanganate as a hot soak, particularly in the many cases we have had associated with *Trichophyton* infections, has been very satisfactory. Yeomans gives the following solution as a soothing application.

Phenol liq	4 cc
Calamin praep	8 Gm
Zinc oxide	16 Gm
Glycerin	24 cc
Aq ros	16 cc
Milk of magnesia ad	120 cc
Apply as required to control itching	

Another soothing solution is the following

Phenol	1 0
Zinc oxide	
Powdered starch	
Calaminae	20 0
Glycerin	10 0
Water	q s ad 180 0

Among the dusting powders which are of benefit, zinc stearate is very soothing and reliable. Yeomans gives the following

Phenol	grains x
Amyli pulv	drachms iv
Pulv zinc oxide ad	ounce 1

Hirschman gives the following powder

Chloretone	grains xxx
Pulvis calaminae	drachms 1½
Zinc oxide	drachm ½
Hydrargyri chlor mit	grains xxx
Misce et fiat pulvis	

caused by anorectal pathology will usually be cleared up with the relief of the local condition. Those cases associated with disturbances of the gastro intestinal tract will ordinarily be relieved by correction of their bowel function or other pathology. Many cases, however, will persist and recur over a period of many years and in the long standing chronic cases where secondary infection has set in pruritus ani may be considered a definite disease entity and a long period of treatment is usually required to afford permanent relief.

The treatment of pruritus ani may be divided into two parts: the general or constitutional treatment and the local treatment. We impress upon our patients with pruritus ani the importance of general hygienic measures. Many cases of this disease will be relieved permanently if the parts can be kept dry and clean and any irritation or scratching avoided. The importance of adequate rest and freedom from worry is stressed and many patients will be helped by small amounts of mild sedatives that will insure a good night's rest. It may be necessary to modify the diet of certain patients. We advise such patients to omit the use of ordinary toilet paper and use, following their bowel movements, a piece of cotton moistened in warm water, later powdering the area with a dry type of dusting powder. Cotton or linen underwear should be worn rather than heavy wool materials. At night these people should sleep in a cool room with light bedclothes. The importance of the avoidance of any rubbing or scratching is emphasized and it may be necessary for certain people to wear cotton gloves at night to break this habit. Hot sitz baths will afford at least temporary relief to nearly every case of pruritus ani. When patients complain that they awake in the night with an almost overwhelming itching and desire to scratch we advise them to sit in a hot tub for five to ten minutes and then it will usually be possible for them to return to sleep. In most instances after a few nights the habit can be broken and a good night's rest assured. A continuous wet dressing during the night is of value in certain cases.

Those cases of pruritus caused by systemic conditions will usually be relieved by the relief of their disease although

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Water	q s ad 180 0

Among the dusting powders which are of benefit, zinc stearate is very soothing and reliable. Yeomans gives the following

Phenol	grains x
Amyli pulv	drachms iv
Pulv zinc oxide ad	ounce 1

Hirschman gives the following powder

Chloretone	grains xxx
Pulv eris calaminae	drachms Ij
Zinc oxide	drachm j
Hydrargyri chlor m t	grains xxx
Misce et fiat pulvis	

Many ointments have been advocated. In general we have not advised the use of ointments in these cases but have depended for relief in the mild cases on hot sitz baths, the potassium permanganate soaks, the soothing lotions and the dusting powders. Stimulating ointments may be of some value in the chronic long standing cases.

Pruritus ani caused by specific skin diseases may require other specific remedies depending on the nature of the condition.

It was the custom in our clinic a few years ago to treat all cases of pruritus ani and vulvae with x ray therapy. The majority of cases were relieved but it was soon found that the relief was temporary in nearly every case although many patients remained symptom free for several months. At present we have largely given up the use of roentgen therapy for this condition.

The use of ionic medication, ultraviolet rays and specific vaccines has been advocated for pruritus ani. We have not had any experience with these types of treatment.

The more severe cases of pruritus occasionally will not be relieved by local hygienic measures and more energetic treatment is necessary. The surgical measures commonly employed for this purpose may be divided into two groups: (1) subcutaneous injections and (2) various surgical operations. The object of both types of treatment is to produce a local anesthesia of the parts which will give relief to the patient, break up the vicious cycle of itching and scratching and allow the skin of the anal region to return to its normal healthy condition.

Many reagents have been used for subcutaneous injections. Sterile water injected beneath the anal skin has given temporary relief. One patient in our series was injected with 20 to 30 cc. of 1% of 1 per cent novocain every two weeks for three months with permanent relief. Quinine and urea hydrochloride has been used. In our experience the two most satisfactory substances for this purpose have been alcohol and the various oil soluble anesthetics that have been developed. Among the oil soluble anesthetics the following may be mentioned:

1 Benacol—developed by Yeomans This solution consists of 5 parts each of ethacaine and phenmethylool in 90 parts of purified sweet almond oil

2 Gabriel's original A B A solution Anesthesin 3 per cent, benzyl alcohol 5 per cent and ether 10 per cent in sterilized oil

3 Anucaine developed by Gorsh Consists of 5 parts each of benzocaine and phenmethylool, 1 part butyl aminobenzoate, and $\frac{1}{8}$ part novocain base in sweet almond oil

4 Gabriel's modified solution Nupercaine base 0.5 per cent, benzyl alcohol 10 per cent and phenol 1 per cent in 5 cc of purified sweet almond oil

5 Proctocaine, developed by Morgan with the following formula basic novocain 1.5 per cent, butesin 6 per cent, benzyl alcohol 10 per cent in almond oil

We have used proctocaine in many rectal conditions Its use for the relief of postoperative pain following hemorrhoidectomy has been very satisfactory Five cc of the solution is injected into the sphincters at the time of operation and a partial anesthesia of the sphincters with the relief of spasm and postoperative pain lasting from ten to fourteen days has resulted This solution injected into the base of certain acute fissures will afford relief and allow the fissure to heal It has also been used for the relief of pruritus ani Proctocaine may be injected without pain The initial needle prick is usually noted but following the entry of the needle no more pain is experienced The anesthetic usually lasts from two to six weeks during which time the skin assumes its normal condition Usually only one quadrant of the anal area is injected at a time with 5 cc of the solution and the remaining quadrants injected on subsequent days The injection is given subcutaneously and the area gently massaged after the injection for two or three minutes Relief is instantaneous and may last as long as two years or be permanent We have employed this solution and technic in a number of cases of pruritus with good results and believe that it warrants further trial

The majority of our chronic cases of pruritus ani that have resisted milder measures have been treated with alcohol

injection This treatment is based on the theory that alcohol destroys the nerve ends and produces local anesthesia. One to 3 minims of a 95 per cent solution may be injected subcutaneously 5 mm apart over the involved area as described by Stone, 5 to 8 cc being used. This method has been very satisfactory in our experience and affords relief for many months or longer. Buie infiltrates the subcutaneous area with 20 cc of a 40 per cent alcohol solution which produces the same results. A slough may result from this method although usually no pain is experienced and healing is satisfactory. The use of alcohol for this purpose has been criticized because of the pain produced at the time of injection and the necessity for anesthesia of the patient. Anesthesia is not necessary for the oil soluble anesthetics and for this reason has been increasingly popular.

As a result of our experience we believe alcohol injections produce a more lasting and more complete anesthesia than the oil soluble anesthetics yet the latter have a definite place in the treatment of pruritus ani and with further experience may supplant the use of alcohol for this purpose.

In recent years we have not found it necessary to resort to any of the undercutting type of operations for the relief of pruritus. The original operation described by Ball has been modified by Yeomans, Hirshman, Krouse, Martin and others and will not be described in this paper.

Summary—Pruritus ani is a common and may be a very distressing rectal complaint. We believe all cases have a definite etiological factor and the majority of cases are caused by local anorectal conditions.

The relief of worry and nervousness, attention to local hygienic measures and the correction of anorectal or other pathology will relieve the majority of cases. Long standing severe cases are best managed with the production of local anesthesia by injections of alcohol or the oil soluble anesthetics until the local skin area has returned to its normal state and the vicious cycle of itching and scratching is permanently broken.

AMEBIASIS WITH CARCINOMA OF THE COLON

DONALD T. CHAMBERLIN

CARCINOMA of the colon and amebiasis may occur together. The reported cases are rare but owing to the widespread distribution of the *Endamoeba histolytica* in the United States care must be taken that the investigation of the cause of any particular bloody diarrhea does not stop with the finding of one or the other. In the already voluminous literature on amebiasis there are many references to inflammatory growths in the colon behaving like carcinoma and diagnosed as such clinically where the true nature of the tumor has only been discovered at operation. Gunn and Howard¹ report 3 cases of amebic granuloma of the colon simulating carcinoma in which surgery offered the only relief. In all three *E. histolytica* was found in the stools. These writers suggest that carcinoma may be a sequel to amebiasis but do not report any cases.

In the literature of the past ten years only 12 cases are reported in which carcinoma of the colon and amebiasis occur simultaneously in an individual. Reed and Anderson² report 4, 2 of which were confirmed by a microscopic diagnosis of adenocarcinoma of sigmoid and 2 of which had inoperable carcinoma of the sigmoid with no biopsy. *Endamoeba histolytica* was found in 3 and while there were no parasites found in the stool of the fourth there was a history of infection with frequent relapses and much antiamebic therapy for five years previously. Roux and Savignac³ report 3 cases none of which were biopsied all however had *E. histolytica* in the stools. A Cain⁴ in discussing the paper reports 2 cases from his own practice. Traut⁵ in an article emphasizing the danger of allowing the discovery of *E. histolytica* in the stool

of a patient presenting atypical symptoms to mask a more serious condition reports 1 case. Barger⁶ and Goyena⁷ report 1 case each. Carcinoma may develop in any site of long continued irritation and may occur as a sequel to amebiasis by one of two routes⁷—in an amebic ulcer of long standing occurring in the favorable cancer areas—the rectosigmoid junction and proximal to the internal sphincter and or in the polypoid or adenomatous growths which occur frequently in amebic ulcers of long duration.

Treatment depends on the condition of the patient when first seen. Amebic dysentery often requires weeks or months of therapy. On the other hand it is advisable to operate at once if the malignancy is thought to be early in an effort to prevent metastases. If possible the tumor should be resected first and antiamebic therapy instituted later when the patient has recovered sufficiently to tolerate it.

The case presented below is of unusual interest not only because of the rarity of the occurrence but because of the cessation of bloody diarrhea, colic and tenesmus in spite of the persistence of the *Endamoeba histolytica* in the stools.

S. H., a male of forty five, came to the Lahey Clinic on September 14, 1936 with the chief complaint of frequent loose stools daily containing blood and mucus and associated with colic and tenesmus of fourteen months duration. In April, 1935 he had discovered that he had a tapeworm which was successfully removed in July. From then up to the time of his admission he had a painful bloody diarrhea consisting of 6 or 7 movements daily.

His past history is of significance in that in 1925 he had an excision of an anal fistula and in 1929 and 1930 he was in a sanatorium for pulmonary tuberculosis. In 1934 he had traveled extensively in Central America. His physical examination revealed generalized abdominal tenderness. On digital rectal examination a firm mass was felt on the right posterior wall of the rectum just above the internal sphincter. Proctoscopic examination revealed a nodular carcinoma. Microscopic examination of fresh material obtained at this time

revealed cysts and vegetative forms of *Endamoeba coli* and *E. histolytica*. This finding was confirmed by the Massachusetts State Department of Public Health Laboratory.

On September 23rd, a radical resection of his rectum was done, from which he made an uneventful recovery. His subsequent course was excellent. On his last visit to the clinic he had gained 20 pounds, was eating a normal diet, and having a formed stool through his colostomy once in forty eight hours. A check up of the stool showed the persistence of *Endamoeba histolytica* and he was given a course of emetine hydrochloride, hypodermically and chiniofon by mouth.

Conclusion—The occurrence of carcinoma of the colon and amebiasis is rare, but it is a possibility in any case having a history of bloody diarrhea. Proctoscopy, barium enema and microscopic examination of sigmoidal contents should be carried out in all cases, presenting such a condition, and the presence of one should never be considered as ruling out the other as a contributing cause.

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THE SIGNIFICANCE AND TREATMENT OF COLONIC AND RECTAL POLYPS

RICHARD B. CATTELL AND NEIL W. SWINTON

WITH the increasing use of the anoscope and proctoscope for direct visualization of the rectum and rectosigmoid in the routine study of rectal and colon disorders it is apparent that benign polyps of the large bowel are more frequent than has been recognized in the past. It has been clearly demonstrated that these benign tumors may undergo malignant degeneration and it can be assumed that the incidence of carcinoma of the rectum and colon will be reduced by the early removal of these benign lesions. We believe that the importance of the removal of these polyps has not been sufficiently emphasized. Their removal is not a difficult technical procedure and usually may be done without anesthesia and with no disability of the patient.

The term "polyp" refers to the form of the lesion and not to its histologic structure. A polyp is a tumor arising from the bowel wall, projecting into its lumen and usually attached to the wall by a pedicle. Polyps may be classified according to their location: anal, rectal, colonic, etc., and may also be classified according to their structure. Four main types of rectal and colonic polyps are commonly recognized and are described as follows:

1 **Fibrous Polyps**—These polyps are usually firm, hard lesions made up of the submucosal structures and covered with a normal layer of mucous membrane. The most common types of fibrous polyps are the hypertrophied papillae and fibrous hemorrhoids which are found in the anal area. These polyps should be removed when encountered because of their

tendency to prolapse and cause local anorectal symptoms but they probably never undergo malignant degeneration. Polyps of this nature may usually be removed through the anoscope without anesthesia of the sphincter muscles. Following local infiltration of the base of the polyp with 0.5 per cent novocain solution and ligation of the base with a catgut suture the polyp may be excised without difficulty. Care must be taken in the control of bleeding from these areas as hemorrhage may result from the small arteries which are usually present in the stalk of these tumors.

Other types of fibrous polyps are rare but should be removed when discovered because of their tendency to cause local symptoms. The lipoma, true fibroma, leiomyoma, fibromyoma, chondroma, myxoma and angioma are other types which have been described.

2 Mucosal or Adenomatous Polyps—Mucosal polyps are made up of mucosal elements and are of the utmost importance because they frequently undergo malignant degeneration. They are found most commonly in the rectum but may occur in any part of the gastro intestinal tract. Next in frequency to the rectum they occur in the ileum, colon, ileocecal valve and duodenum. Mucosal polyps may be of sessile or pedunculated form, single or multiple and are of varying size. Mucosal polyps occur most frequently in children where they are usually single and seldom larger than a walnut. In adults they may attain much larger sizes, even completely filling the bowel lumen at times. The sessile form of these tumors has a broad base and more commonly undergoes malignant change. In the pedunculated form the pedicle may vary from 1 cm. to several inches in length depending on the size and duration of the tumor. Occasionally these pedicles are broken off due to local increased peristaltic action of the bowel and spontaneous cure results. More commonly, however, excision is necessary and this is best done with the high frequency snare as will be described later in this paper. Polyps found above the rectosigmoid are removed by laparotomy, by colotomy, or by resection depending on the nature and size of the lesion.

In children the symptoms produced by these tumors are usually constipation, tenesmus, and the appearance of blood and mucus in the feces. Protrusion of these tumors through the anus is common. In adults the pedicles are usually short or the tumors are of the sessile form, protrusion is uncommon and bleeding and a sense of weight in the pelvis are the chief symptoms.

The diagnosis of these tumors is not difficult and many of them will be palpated with the examining finger. The majority of the mucosal polyps, however, will be found only by direct visualization of the rectum through the proctoscope.

3 Papilloma or Villous Polyp—This is a very rare type of polyp, less than 100 cases having been reported in the literature. They arise from the bowel mucosa usually in the rectum, and usually have a broad base rather than a pedicle. These tumors are made up of multiple villi conjoined at their base, are red in color and bleed very easily on manipulation. Debility may result from the excessive bleeding associated with these tumors and they should be removed with a careful extirpation of their base when found, as they are very prone to become malignant.

4 Multiple Polyposis or Adenomatosis of the Colon—This disease may be of 2 types, the familial or congenital type, and the acquired or inflammatory type. The familial type of this disease is rare, but is the most serious type of benign lesion of the large bowel. The inflammatory type is the more common and is usually associated with ulcerative colitis or dysentery of some type. The adenomata are found most commonly in the lower sigmoid and rectum but may involve the entire mucosa from the ileocecal valve to the anus.

The course of this disease is usually progressive. Hemorrhage, diarrhea, pain and weight loss are the important symptoms early in the disease. Later anemia and toxemia may develop and extensive ulceration of the mucosa will be found. This disease in itself may cause serious constitutional symptoms, but more important is the very high incidence of malignant degeneration found with multiple congenital polyposis of

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the colon Ewing states that nowhere else can the change from normal mucosa to inflammation, gland cell hypertrophy, adenoma and adenocarcinoma be so clearly demonstrated as



Fig 248—An adenomatous polyp removed from sigmoid region by sigmoidotomy

it may in this disease Malignant degeneration may be multiple and in our series of cases we have had several such instances

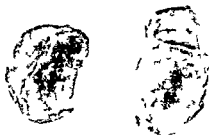


Fig 249—Two adenomatous sessile polyps removed from the rectum with the high frequency snare These polyps are very prone to become malignant and careful and thorough cauterization of the base is important

The diagnosis of multiple polyposis is based on the history of diarrhea and bleeding and the physical findings Multiple polyps may be palpated digitally but proctoscopic and con

trast bismuth enema examinations are necessary to determine the exact nature of the pathology present and the extent of the condition. Biopsy of these polyps may be of aid but may be misleading in that the malignant area of polyps may be situated at a high level and escape notice. We believe that in the advanced cases complete colectomy is the operation of choice and the only way the development of cancer may be avoided. In our cases we have usually removed the bowel from the terminal ileum down to and including the rectum in a three stage operation as described in this volume under the article on ulcerative colitis. Removal or destruction of the rectal polyps by the snare and cautery with anastomosis of the ileum to the rectum has been advocated and we have one such case who has now been followed for one year and is well.



Fig 250—Pedunculated adenomatous polyp removed with high frequency snare. Note length of pedicle.

In Fig 251 the instruments commonly employed by us for the diagnosis and treatment of these conditions are shown. (A) and (B) are 2 types of anoscopes which are useful for the detection and treatment of pathology in the anal area. With the fenestrated anoscope (B) an excellent exposure may be obtained of the anal ring and papillae and fibrous polyps in that area may be easily removed. The suction tip (C) is very useful in the removal of liquid feces as well as the smoke caused by coagulation (this tip is 11 inches in length so that it may be used through the 10 inch proctoscopes as well as the anoscopes). (D) and (E) represent 2 types of biopsy forceps that may be utilized through the proctoscopes. We have found 3 types of proctoscopes useful in this work. The Leomans proctoscope (G) is excellent for diagnostic work. The light

bulb situated at the proximal end of the scope gives adequate illumination and does not become clouded with feces as easily as does the Buie (*F*) proctoscope. The light bulb in the Yeomans scope, however, projecting into the lumen of the instrument causes some interference with the passage of instruments and for operative work the Buie proctoscope has advantages. The bakelite instrument (*H*) is used with the

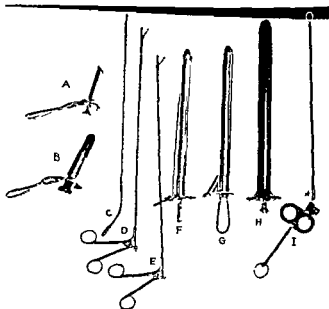


Fig. 251.—Instruments useful in the detection and removal of rectal polyps.

high frequency snare when possible. It is a nonconductor of electricity and very safe for this reason, but is cumbersome and for very high lesions the metal instruments are usually necessary. The snare used with the high frequency current is shown in (*I*). This instrument has been very useful in our experience and is routinely used for the removal of all mucosal polyps. A low current is used and adequate time taken in the removal of these polyps so that bleeding is con-

trolled and the base of the lesion carefully cauterized. Care must be taken, however, to limit this cauterization so that perforation does not occur. Instruments longer than the 10 inch proctoscopes have not been particularly useful in our hands and seldom used. The usual sigmoidoscope is 14 inches in length and at times may be required. These instruments are made in various diameters and in children the smaller instruments are necessary.

In conclusion we wish to emphasize that polyps of the large bowel, particularly of the lower sigmoid and rectum are common and will be found by the routine use of direct visualization of the lower bowel in the examination of patients with colon and rectal disorders. Because of the potential danger of malignancy in these tumors they should be removed when discovered, preferably by the use of the high frequency electric snare.

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X RAY TREATMENT OF CANCER OF THE COLON AND RECTUM A NEGATIVE REPORT

HUGH F HARE

DURING the past three years 13 cases of recurrent carcinoma of the colon and rectum have been treated with protracted deep x ray therapy. The purpose of this study has been to determine as accurately as possible the reaction of the patients to and the results obtained from this type of treatment. Moderately large doses of x ray have been given to all of these patients. As far as possible an outline of treatment was established before therapy was started in order to arrive at a fair conclusion.

The medical literature concerning cancer of the colon and rectum largely deals with diagnosis and surgical treatment. There are several articles dealing with radium treatment, a few dealing with preoperative x ray treatment, but none dealing with x ray treatment alone. The five year end results are published for surgical treatment and for preoperative radiation treatment. There are no five year results from radium or x ray alone. I judge from the literature that x ray treatment has been unsuccessful in the treatment of these cases—not by articles so stating but by the absence of papers dealing with results obtained. It is hoped by this negative report that the further use of x ray treatment for these cases will be discontinued. True this is a small series of cases on which to base judgment, but with the results obtained I think these tumors have been proved to be resistant to the x ray, and that for the most part we are doing more harm than good by treating this type of cancer.

injection was attempted without relief. Three months prior to entry he had noticed pain down both legs at times. During the last seven weeks he had noted increasing constipation and that the caliber of his stool was smaller than previously.

Physical examination showed a fairly well developed but undernourished white male with a negative general physical examination except for a cauliflower type of growth on the right lateral and posterior wall of the rectum which extended the length of the index finger inward and was about 5 cm in diameter.

A clinical diagnosis of carcinoma of the rectum was made and the patient was advised to enter the hospital for operation. On September 22, 1934, a Miles resection for carcinoma of the rectum was performed under metycaine spinal anesthesia. It was felt at this time that all of the carcinoma had been removed although the pathologic report showed a malignant adenoma of the rectum with metastasis to 2 of 8 regional lymph nodes. A note of March 15, 1935, seven months post operative, is as follows: excellent general condition, weight 165 pounds, a gain of 30 pounds since operation. Posterior end healed. Colostomy perfect. There was no evidence of recurrence. A similar note was made in September 1935. On March 2, 1936, he returned complaining of burning and discomfort in the perineum, more marked in a standing position. The colostomy worked well. Physical examination at this time revealed no palpable mass in the abdomen. The liver was not palpable. There was a hard movable nodule 3 cm in diameter on the base of the incision over the membranous urethra. This was diagnosed as a local recurrence. x-ray treatment was advised and given.

This patient was given x-ray treatment starting March 3, 1936. A total of 3300 r units was given through 3 portals, 1200 r units being delivered directly to the local growth. 300 r units were given daily using the following factors: 200 kilovolt potential, 60 cm distance, 22 milliamperes, 80 cm portal. Note made one month following radiation treatment states that he received no relief of symptoms, the pain in the

METHOD OF TREATMENT

Out of the 13 cases, 2 were inoperable and 11 were recurrent following previous resection. In the 11 cases the recurrence was not proved pathologically before treatment was started, but the subsequent course of the disease bore out our opinion in every case.

It is our opinion in treating any hollow viscus that the lumen should be patent. In all of the cases studied either there was a satisfactorily functioning colostomy or else a successful Mikulicz resection. In so far as possible we chose cases that had superficial local or distant metastases. All cases had been treated ambulant in the clinic daily, demonstrating that at the time treatment was instituted the patients were in good physical condition.

The following factors have been used: 200 kilovolts, 22 milliamperes, distance, 60 cm., filter, $\frac{1}{8}$ mm. copper and 1 mm. aluminum. The size of the portals varied between 80 and 150 sq. cm. depending upon the amount of involvement and upon the amount of radiation sickness encountered. Treating one portal daily and varying the daily dose from 200 to 300 r, a total dose of 1200 r was delivered to each portal during the series. An attempt was made to deliver at least 2000 r into the midportion of the tumor. In 3 patients x ray was used in conjunction with radon. These cases receiving 4000 mc. hours radon screened through 2 mm. brass in addition to the 2000 r of x ray into the tumor.

CASE REPORT

The case reports all presenting the same characteristics, only 1 case report will be given as typical.

Case I—A male patient forty one years of age entered the clinic complaining of rectal bleeding, rectal pain, constipation and ease of fatigue, of eight months duration. He went to his physician six months before entering the clinic, at which time a diagnosis of hemorrhoids was made and treatment by

- 1 Relief from pain is not attained
- 2 These tumors are radioresistant
- 3 The clinical course is not as satisfactory following treatment as when no x ray treatment is given
- 4 It is fair to assume that all cancers of colon and rectum should be treated by surgery without preoperative x ray treatment
- 5 The radiologist's problem in cancer of the colon and rectum is diagnostic rather than therapeutic

rectum remains there has been no definite change in the size of the mass. There has been no weight loss. He was again observed in June when practically the same note was made and dilaudid ($\frac{1}{4}$ grain) was given for relief of his pain. He was then advised to enter the hospital for alcohol injection in the hope of giving him relief. This was performed September 13, 1936. He is still living but confined to his bed. No relief of his pain only 3 more alcohol injections.

RESULTS

A series of 13 cases similar to the one described above has been treated. In no case was relief of pain obtained even temporarily. In most cases the symptoms of which the patients complained were aggravated and in all cases the general condition of the patient was at least temporarily made worse due to the effect of the x ray. In some cases where tenesmus was present at the beginning of the treatment it became markedly aggravated and in 1 case could not be successfully relieved by medication. Two cases developed symptoms of bladder irritation namely burning and frequency of urination.

In none of the cases was life prolonged or made more comfortable by x ray treatment.

As to retrogression of the growth some of the cases were not suitable to determine this accurately but in 4 of the cases the lesions were superficial could be examined frequently and in none was retrogression noted and from clinical observation I think it fair to assume that no retrogression was attained in the other cases.

x Ray treatment delivered in fractionated doses to superficial malignancies recurrent from carcinoma of the colon or rectum failed to cause retrogression of the growth.

CONCLUSIONS

Through the observation of the treatment of 13 cases of inoperable or recurrent carcinoma of the colon by x ray treatment, using the fractionated dose method we learn that

- 1 Relief from pain is not attained
- 2 These tumors are radioresistant
- 3 The clinical course is not as satisfactory following treatment as when no x ray treatment is given
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ANORECTAL FISTULAE

NEIL W SWINTON

ANORECTAL fistulae are very common proctologic conditions comprising according to Yeomans one fourth of the cases of rectal surgery. The end results following proper surgical treatment are very satisfactory yet the incidence of recurrence following improper management is high. In the following brief general discussion and illustrated case reports important factors in the treatment of this condition will be outlined.

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Anorectal fistulae are always (with the exception of rare traumatic cases) preceded by abscess formation. The abscess is formed by the entry of pathologic organisms into the tissues surrounding the rectum through the base of a fissure or an infected crypt. The abscess then erupts into the lumen of the bowel or on the skin surface or both, the communication thus established together with the contracted abscess cavity forming the fistula. The openings of these tracts are prone to epithelize over the abscess to recur and new sinus tracts and external openings to be established. External appearances of these cases are very deceptive. The abscesses burrow rapidly

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that point because of the nearly parallel nature of the fibers of the sphincter muscles and it has been reported that 90 per cent of all anal fissures occur at the posterior commissure. A rule which has been recognized by proctologists for some time called Salmon's law states that when the external opening of a fistula is within 5 cm. of the anus and anterior to a transverse line crossing the center of the anus the internal opening is radially opposite. Most fistulae with external openings posterior to this line or more than 5 cm. away from the anus anterior to this line have their internal opening at the posterior commissure.

In general the surgical treatment of anorectal fistulae consists in the incision or excision of the main sinus tract together with its ramifications down to the internal opening either as a single or multiple stage procedure. Following operation the prevention of any bridging over of the sinus tract with resulting recurrence of the fistula is very important. It is not necessary to completely excise all granulation tissue surrounding these tracts if the tracts are laid widely open and excessive skin and mucous membrane excised and if the bases of the tracts are cauterized so that healthy granulation tissue remains.

Failures in the surgical treatment of anorectal fistulae are due to 3 factors

- 1 *Failure to Discover the Internal Opening of the Sinus Tract*—Usually the internal opening can be demonstrated with a fine probe at the time of operation. If it is not found with a probe however we do not hesitate to inject the tract with methylene blue or some similar dye. With the anorectal canal under direct vision the dye is injected into the external opening with a Luer syringe and in most instances an internal opening can then be demonstrated by the appearance of the dye on the mucous membrane wall. The use of methylene blue has been objected to on the grounds that it stains the surrounding tissues to such an extent that proper dissection is difficult after it has been used. By walling off the external opening with a gauze sponge immediately packing the rectum

through the fatty cellular tissues surrounding the bowel and these sinuses and abscess cavities at the time of operation may be found to be very extensive. Fistulae rarely heal without surgical intervention. The tracts are repeatedly reinfected by the passage of feces and mucus through the internal openings and the almost constant motion of the parts due to contractions of the sphincter and levator muscles works against any natural tendency of the individual to heal such a sinus. Why blind external fistulae persist is more difficult to explain but we believe that these fistulae are in reality complete fistulae where the internal opening is temporarily sealed off or not detected. Tuberculosis has not been an important etiologic factor in our series of fistulae.

The diagnosis of an anorectal fistula is not difficult. There is usually the history of an abscess that has been incised or has spontaneously ruptured. Following this rupture there has been a constant or intermittent drainage of pus from either the external sinus or in the case of the blind internal fistula from the rectum. Although there is usually associated a dull ache or feeling of heaviness pain will not be a prominent symptom when drainage of the tract is adequate but with the sealing off of the internal opening or external opening or both symptoms of a recurrent abscess may develop. Examination of the skin about the anus will usually reveal the external opening. With the index finger in the rectum the cordlike sinus tracts can ordinarily be palpated and pressure on them will express a drop of pus from the external opening of the fistula. The internal opening can often be palpated at that time. The internal opening should also be visualized with the fenestrated anoscope. In those rare instances when the internal opening cannot be visualized or located with a fine curved probe its presence will usually be demonstrated after the injection through the external opening of methylene blue or other dye.

The majority of the internal openings of fistulae will be found in a line with the posterior commissure of the anal canal. Trauma to the mucous membrane lining of the anal canal due to the passage of hard stools is most frequent at

narily the internal opening of the cavity will be in the usual position—the level of the crypts. When such is the case it is not necessary to split the wall of the rectum and divide the sphincter muscles beyond the level of the internal opening into the rectum but the cavity above must be adequately opened and carefully followed postoperatively so that it granulates solidly from the bottom and does not bridge over. Case V is another example of this type. An early diagnosis of an infected pilonidal sinus was made. When first seen the draining sinus was lateral to the coccyx and the presence of an internal fistulous opening was not suspected. This case represents an ischiorectal abscess that perforated through the skin at an unusually high level. It was not until after this excision of a supposed pilonidal sinus had been done with resulting failure that the demonstration of an internal fistulous opening was made one year later. A two stage operative removal of the fistula was done and the patient cured.

3 *Improper After care of the Wound*—It is essential at the time of operation to excise sufficient skin and mucous membrane so that there will be no overhanging edges. Following operation on these cases we gently pack the wound with iodoform gauze to keep the edges apart and to control oozing. This pack is removed in from twenty four to forty eight hours and daily thereafter a well lubricated gloved finger is gently passed through the wound to its depth. Too zealous packing of the wound or probing of the wound following the removal of the pack may result in a fecal incontinence due to too wide separation of the sphincter edges. Our patients are placed on a low residue diet the day following operation but after the third day we give them a full diet and an oil enema so that following the third day they will have normal daily bowel movements. Daily sitz baths given if possible following these bowel movements will keep the area clean and allow proper healing to take place. The majority of our patients are discharged from the hospital in from seven to ten days following operation and are asked to report to the clinic for careful observation of the wound every two or three days until the

for a short time with gauze as soon as the internal opening is noted, the excess dye in the cavity can be expressed and the only staining will be of the sinus tract itself. We have not found that methylene blue interferes in any way with the proper excision of the sinus tract and its internal opening and in many instances is very helpful. Occasionally, however, even with the use of the dye an internal opening cannot be found. Many times a reddened indurated area in the region of the crypts will be seen which represents an internal opening that is temporarily sealed off. When this situation is encountered we either gently force a probe through the mucous membrane of the anal canal at that point or excise an area of mucous membrane in that region which we are certain includes the closed internal opening. Very rarely a normal lining of the bowel will be found and no suggestion of an internal opening seen. Although blind external fistulae are very rare we believe they occasionally do occur and when there is no evidence of an internal opening at any point it is safe to drain the sinus externally and not open into the rectum. During the past year we have had two such cases which were treated in this manner after every means at our disposal had been exhausted to find an internal opening and they both healed promptly and there has been no evidence of recurrence. However in reviewing the causes of recurrence following operations on anorectal fistulae the most common cause of failure has been the failure to find the internal opening at the time of operation.

2 *Failure to Discover and Open Secondary Sinuses*—With careful dissection of the main sinus tract most of the ramifications will be encountered and opened without much difficulty. In our experience the tracts which are the most difficult to drain freely are those running high along the wall of the rectum beyond the internal opening. Case III illustrates this point. An abscess perforating the levator ani muscle and fascia and entering the ischio-rectal space can form a large pocket high up along the rectum which may be difficult to drain. Care must be exercised in these cases to be certain that there is not a high internal opening into the rectum but ordi-

CASE REPORTS

Case I—J C, male, aged fifty six This patient on admission gave a history of recurring anorectal abscesses over the past four years Two years previous to admission an unsuccessful operation for anorectal fistula had been done His condition at the time of admission is shown in Fig 252, 1 This case represents the typical 'horseshoe' type of anorectal

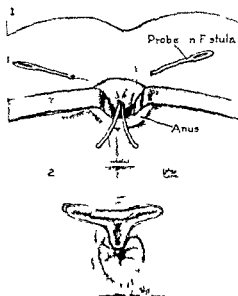


Fig 252—Case I

fistula with the internal opening at the posterior commissure and at a level with the crypts of Morgagni Figure 252, 2 demonstrates the type of excision used in the treatment of this type of fistulae The sinus tract has been laid open to its base, excessive skin and mucous membrane excised and care has been taken to divide the sphincter muscles at right angles to the direction of the fibers of the muscles down to the internal opening of the fistula

sinus tract is completely filled in. With patients coming from a distance we insist that they either remain in the hospital or in the vicinity where they may take daily sitz baths and report to us frequently until healing is assured.

Spinal or caudal anesthesia is the anesthetic of choice for these operations because of the excellent relaxation of the perineal and perianal muscles. We routinely use spinal anesthesia for our cases because of the ease of administration. Although many surgeons prefer the lithotomy position for this work, we prefer the position used by Dr. Buie as we believe it gives the best possible exposure of the area involved. The patient is placed in a prone position on his face and a blanket roll 6 inches in diameter is placed beneath the hips. With lateral retraction of the buttocks by the assistant or nurse an excellent exposure of the anus and all surrounding structures is obtained. In our experience this position has been of great aid in the accurate dissection of these sinus tracts.

In recent years we have utilized the multiple stage operation in the treatment of certain selected cases of anorectal fistulae with success. Stage operations in the treatment of fistulae are particularly adapted to 3 types of lesions: (1) where the internal opening of a fistula is at such a high level that all or nearly all of the sphincter muscles must be divided at the time of operation with the possibility of a resulting incontinence; (2) Certain very extensive cases of fistulae with multiple sinus tracts and external openings. In this group of cases healing of the excised sinus tracts will be more rapid and there will be less danger of incontinence if the sinus tracts are allowed to heal before the sphincters are divided and the rectum opened with the necessary contamination of the wound with feces; (3) In the rare multiple fistulae. The technic of multiple stage operations in the treatment of the fistulae will be described in the following case reports. With healing of the excised sinus tracts beyond the sphincter muscles a bridge of scar tissue is built up which prevents wide separation of the muscle fibers at the time of their division and thus minimizes the danger of incontinence.

muscle fibers had had to be divided to reach the internal opening a two stage operation would be the procedure of choice. Although a superficial segment of the sphincter muscles may be excised without danger of incontinence if the internal opening of the fistula is at such a high level that the greater part or all of the fibers of the sphincter are involved the division of the muscle should be done at right angles to the muscle fibers and segments of the muscle not be removed if a fecal incontinence is to be avoided.

Case III—J O female aged fifty four. This patient on admission gave a history of rectal pain of one week's dura-

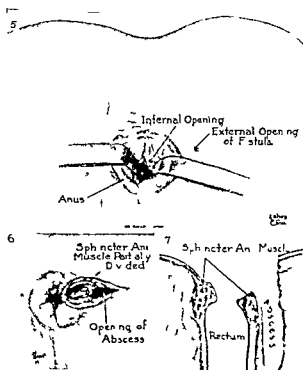
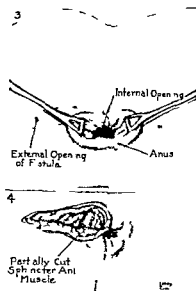


Fig. 54—Case III

Case II—C M male aged thirty six Following hemorrhoidectomy three years previously this patient had developed an anorectal abscess which had been drained at once During the next three years 3 recurrent abscesses had been drained and the patient had undergone 2 unsuccessful operations for the cure of his fistula Figure 253 3 demonstrates the position of the external and internal openings of his fistula at the time of admission Failure to demonstrate and properly excise



F. 2 3—Case II

the internal opening of this fistula was the probable cause of failure following the previous operations

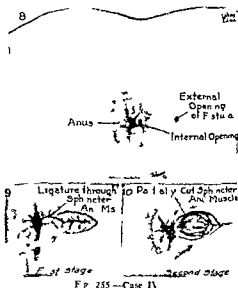
Figure 253, 4 demonstrates the type of excision necessary to cure this type of fistula Note that it is necessary to excise a wide margin of skin and mucous membrane and even a segment of superficial muscle fibers to obtain proper drainage and healing of such a sinus If the internal opening of this fistula had been at such a level that all or most of the sphincter

the internal opening would involve division of nearly all of the sphincter. Because of the potential danger of a fecal incontinence in such a situation a two stage operation was performed. Figure 255, 9 demonstrates the first stage operation. The sinus tract down to the level of the sphincters has been excised and a heavy black silk suture has been passed through the internal opening of the fistula at the bottom of the cavity and loosely tied around the sphincters. We have never utilized elastic ligatures for this purpose nor tied the silk sutures tight enough so that they would spontaneously cut through the muscle fibers. When this is done postoperative pain is excessive and the end results are not satisfactory. Six weeks later, or at a time when the sinus tract was completely healed, the seton was excised by dividing the sphincter down to the internal opening (Fig. 255, 10). The block of scar tissue beyond the sphincters prevents the cut ends of the muscle from retracting and incontinence rarely if ever develops following operation by this method. We have completely divided the internal and external sphincter muscles in order to reach the internal opening of an anorectal fistula in several instances and have never had an incontinence develop following operation by this plan.

Case V—E. D. male, aged thirty eight. This case represents one of the most extensive anorectal fistulae with which we have had to deal. In April 1935 three weeks following hemorrhoidectomy, he developed rectal pain and a high fever. Two days later following the passage of large amounts of pus from the rectum and from an abscess lateral to the coccyx his pain and temperature subsided. In October 1935, examination revealed multiple draining sinuses in the region of the coccyx, a diagnosis of pilonidal sinus was made and a radical excision of the infected area was done. Following this operation the sinus failed to heal new sinuses developed, and in July, 1936, he presented the condition demonstrated in Fig. 256, 11. Multiple draining sinuses of the buttocks extending beyond the level of the coccyx and an internal opening at a

tion Three days after the onset of this pain there was a profuse discharge of pus from the rectum and from an external sinus. Figure 254 5 demonstrates the condition present on admission. Figures 254 6 7 demonstrate the internal opening of the fistula the abscess cavity and the depth of the cavity beyond the internal opening. It is not necessary to incise the wall of the rectum and the sphincter muscles beyond the internal opening of the fistula if the abscess cavity is properly drained and kept open postoperatively so that it heals in from the bottom.

Case IV—R H female aged twenty-eight. This patient on admission gave a three year history of recurring rectal ab



scesses for which several operations had been done. In Fig 255 8 the site of the fistulous openings as presented at the time of admission are shown. The internal opening was unusually high in the rectum and excision of the tract down to

90 per cent healed he has perfect bowel control and we anticipate a good result

Case VI—G L male aged twenty four One year previous to admission this patient developed a rectal abscess which was drained During the ensuing year he had had

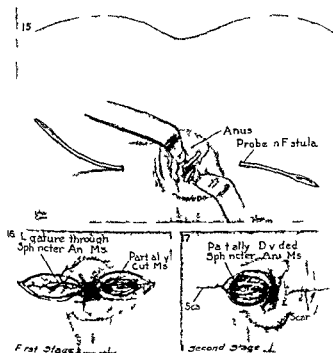


Fig. 257—Case VI

several other rectal abscesses which ruptured spontaneously. Examination on admission (Fig. 257 15) demonstrated two complete fistulae with the external and internal openings as shown in the diagram. In cases of multiple fistula the two stage operation is very valuable. The complete division of the sphincters at more than one position at one time almost invariably results in rectal incontinence. The plan of man-

level beyond the uppermost fibers of the internal sphincter muscles were found. A one stage removal of such a fistula with the extensive excision of the sinus tracts and necessary complete division of the sphincters would most certainly have resulted in a fecal incontinence. Accordingly on July 6, 1936 we performed a first stage excision as may be seen in Fig

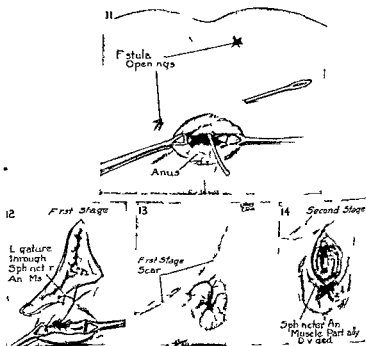


Fig. 256—Case 1

256 12 The external tracts were laid widely open and a silk ligature was passed around the sphincters through the internal opening of the fistula. Figure 256 13 demonstrates the healed tracts with the silk suture in place in January of 1937. At that time the second stage operation (Fig 256 14) was performed. At the present time eight weeks later the sinus is

THE PREVENTION AND TREATMENT OF POSTOPERATIVE PULMONARY COMPLICATIONS BY BRONCHOSCOPIC ASPIRATION

REEVE H BETTS AND RICHARD H OVERHOLT

POSTOPERATIVE pulmonary complications are a perennial problem that continually confronts both the surgeon and the medical man. Patients with normal cardiorespiratory systems frequently develop such conditions postoperatively while patients with impaired cardiorespiratory systems are so often afflicted that one who cares for such patients must continually be on the alert in order to prevent them or at least institute treatment before they become well established.

Some idea of the risk can be obtained from Table 1 which

TABLE 1
PULMONARY COMPLICATIONS*
(Excluding Bronchitis)

Operation	No. of cases	Complications per cent.
All operations	065	6
Laparotomies and herniae	3037	13
Excluding laparotomies and herniae	408	1

* Reported by King¹

was taken from King's¹ work at the Massachusetts General Hospital. He found that a pulmonary complication occurred following operation in 6 per cent of all cases. By pulmonary complications he means definite atelectasis, pneumonitis, or pneumonia which was demonstrable on physical examination,

agement in this case is seen in Figs 257, 16, 17. At the first stage operation one fistula was completely excised and the sinus of the second excised down to the muscle. Six weeks later with the muscle fibers firmly healed at the position of the first division the sphincter was divided at the second location.

the aeration of the lower part of the lungs. The less well aerated the easier it is for secretions to collect in the bronchi and bronchioles and thus still further prevent an exchange of air.

Coryllos³ has concluded from a good deal of thought and study that all these complications are based primarily on atelectasis. Once a small bronchiole becomes plugged with mucus the portion of lung supplied by this airway becomes shut off from the rest of the lung. The air in this portion is soon absorbed by the blood passing through the capillary bed so that in a short time we have a segment of lung that is airless and therefore functionless. The area of lung involved is wholly dependent on the location of the obstruction. It is true that small areas of atelectasis develop after many abdominal operations but the smaller areas do not sufficiently disturb the respiratory physiology to become clinically evident.

What the outcome will be in the atelectatic area depends largely on two factors. First how long the airway is occluded and second what organisms are present. If the airway is only blocked for a short time by rather thin secretions it is easy for the patient to clear the airway by a few effective coughs. Should the material be tenacious and all the air distal to the obstruction become absorbed it is more difficult to dislodge. With some air distal to the plug of mucus it is possible that it may be dislodged by coughing. If there is no air in the alveoli the patient has nothing with which to blow out the plug and a deep inspiration in an attempt to get air into that portion of the lung may only force the plug deeper.

Uncomplicated atelectasis will as a rule improve spontaneously in twenty four to forty-eight hours. Rolling the patient from side to side and urging him to cough is often all that is required. However if in this atelectatic area there are sufficient pathogenic organisms the groundwork is laid for a subsequent pneumonitis, pneumonia or gangrene this largely being dependent on the type of organism present. It is easy to understand how an atelectatic airless region is a fine culture medium for the organisms responsible for pulmonary gangrene and

x ray, or both This does not include cases of bronchitis which constitute another 3 per cent They occurred following 13 per cent of all laparotomies and herniae but in only 1 per cent of all extra abdominal cases

It has long been recognized that complications most frequently follow upper abdominal operations and are more common in male than in female patients These two factors are brought out in Table 2 which shows that pulmonary complications developed following operations on the stomach or

TABLE 2
PULMONARY COMPLICATIONS*

Operation	Male per cent	Female per cent
Stomach and duodenum	47	17
Gallbladder	36	14
Appendix	14	6

* Reported by King¹

duodenum in 47 per cent of the male cases but in only 17 per cent of the female cases The corresponding figures for gall bladder operations being 36 per cent and 14 per cent respectively The higher incidence after upper abdominal operations and in males is due to the same factor—impairment of diaphragmatic function It has been shown by Overholt² that after upper abdominal operations there is a marked elevation and limitation of the diaphragmatic excursion The fact that men show a greater tendency to pulmonary complications is probably due to the fact that normally their breathing is largely abdominal Alterations after abdominal operations therefore are not as well tolerated as by women whose breathing is more thoracic in type

There are no doubt a number of factors involved in the production of such complications Depression from medication and anesthesia pain in the wound and the elevated diaphragm that follows abdominal operations all tend to lessen

Patients following thoracic operations are even more apt to develop pulmonary complications than the general surgical patients due to the excessive amount of secretion which is almost always present and the disturbed cough mechanism following operations involving the thoracic cage. In such cases, beside the usual picture accompanying atelectasis of some portion of the lung we see another syndrome which is clinically quite different. The first day or two postoperatively may pass without incident, and the acute episode usually occurs at night. It is due, we believe to the depression of the cough reflex and the general relaxation which accompanies sleep. Patients with this condition are usually found to present the picture of postoperative shock even though they may have been apparently all right a short time previously. Slight cyanosis noisy respirations unobtainable pulse and blood pressure and inability to rouse the patient are the usual findings. Stimulants and intravenous fluids may bring the patient back to consciousness and he may be encouraged to clear the air passages by coughing. Usually no matter how much the patient tries he is unable to cause anything more than a rattling in the chest and fails to actually raise the secretions. The patient may quickly lapse into unconsciousness and die of anoxemia. Energetic treatment should be introduced quickly whenever it is found that the patient cannot effectively raise the material. We have seen several instances of this complication in the thoracoplasty cases and believe that it is due to a gradual accumulation of secretions during the first twenty-four to forty-eight hours postoperative. The patient is able to get along quite well during the day, coughing up enough of this material to give him sufficient pulmonary ventilation. However, accumulation of material in the tracheobronchial tree from failure to cough due to weariness toward the end of the day added to the secretions formed during four or five hours sleep partially occludes many bronchioles and prevents proper aeration of the blood. This slowly developing anoxemia is too great a load for the probably already damaged cardiovascular system and thus the patient goes into shock. The only way to

some types of lung abscess. If a definite pneumonia becomes established, the mortality is from 20 to 25 per cent. Atelectasis should be remedied before infection sets in. The surest way to remove the obstruction is by bronchoscopic aspiration.

Figure 258 shows the course of a patient with atelectasis treated bronchoscopically. This patient had a difficult operation with considerable postoperative shock necessitating a

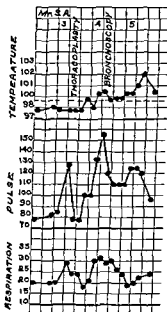


Fig. 258—Chart of patient with atelectasis treated by bronchoscopy and aspiration

transfusion. Such depression favors the collection of secretions which in this instance occluded the bronchus to the right lower lobe as evidenced by absent breath sounds over the right lower chest. Early, atelectasis may cause a high pulse rate without a corresponding rise in temperature. The patient was bronchoscoped on the first postoperative day and within a short time felt as well as before the acute episode.

even though it was obvious that there was a large amount of material in the trachea and bronchi. Examination of the chest revealed breath sounds coming through over all lobes and loud gurgles of tracheal origin. He was immediately bronchoscoped and a large amount of tenacious material aspirated. The relief was immediate and the next morning he felt as well as if nothing had happened.

Undoubtedly many patients die by drowning in their own secretions. Patients who have bronchiectatic or pulmonary



Fig. 260.—Postoperative x ray of Mr. C. H. showing reservoir of fluid in left hemithorax.

cavities continually run the risk of a sudden expulsion of this fluid into the communicating air passages to the other portions of the lung. A similar situation is encountered occasionally following any major operation when the patient develops a pleurisy with effusion or an empyema. A sudden rupture of this fluid into the lung may virtually drown the patient.

Mr. C. H. had a total left pneumonectomy for bronchogenic carcinoma, the chest being closed without drainage. Serum soon partially filled the hemithorax as shown in the roentgenogram reproduced in Fig. 260. On the thirteenth

effectively break this cycle is to remove the retained secretions

The chart of a patient presenting the second type of complication necessitating bronchoscopy is shown in Fig 259. This patient had extensive pulmonary tuberculosis and a second stage thoracoplasty had been performed. He was apparently doing quite well coughing and raising satisfactorily. At 1:30 A.M. he was seen by the nurse and no abnormality

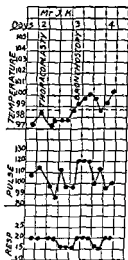


Fig. 259—Chart of patient who developed the clinical picture of shock due to excessive secretions which were removed bronchoscopically

noted. Dilaudid ($\frac{1}{2}$ grain) was given for the relief of pain. Following the medication he again went to sleep. At 3:00 A.M. he was again observed and was apparently sleeping normally. At 3:30 A.M. the nurse thought he was slightly cyanotic and then found that she was unable to obtain either his pulse or blood pressure. He was given 5 cc of coramine intravenously and when I saw him a few minutes later the pulse was barely palpable but the blood pressure was still unobtainable. His breathing was very noisy and he was unable to raise anything

procedure in the postoperative care of thoracic cases. Patients following abdominal operations may develop pulmonary complications which can be successfully relieved by this method.

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3. Corylles, Pol N. Postoperative Apneumatoses (Atelectasis) and Postoperative Pneumonia, *Jour Amer Med Assoc* **93** 98 July 13 1929.

postoperative day a bronchial fistula developed, thus releasing the fluid which flooded the remaining lung. It fortunately happened while we were in the hospital and bronchoscopy was done immediately, a large amount of fluid being aspirated from all the major bronchi. If bronchoscopy had not been quickly available this patient could not have been resuscitated.

Any patient who has difficulty in maintaining an adequate airway should be considered a surgical emergency. Delay in carrying out bronchoscopy may prove fatal. Miss H. C., six days following thoracoplasty, quite suddenly developed dyspnea, slight cyanosis and seemed unable to satisfactorily clear the material in her respiratory passages. She was given stimulants and made to cough and raise, following which improvement was so great that it was felt that bronchoscopy was not necessary. One and one half hours later she again became dyspneic and cyanotic with rapid pulse and soon became unconscious. She was taken immediately to the operating room and bronchoscoped even though she was moribund. Bronchoscopy demonstrated a stenosed right lower lobe bronchus. This had become temporarily occluded and when the dammed up secretions were suddenly released the contralateral lung was flooded. If this patient had been bronchoscoped postoperatively and the stenosed bronchus dilated it would have prevented the collection of material and thereby the disaster which followed its release would have been averted.

Patients even though quite ill following operation are disturbed very little by bronchoscopy. On the thoracic service all patients who have much sputum or who have excessive moisture at the time of operation are aspirated bronchoscopically immediately after operation. It is repeated as often as indicated in the early postoperative period.

The insertion of a bronchoscope and the positive removal of material from the larger bronchi can be accomplished without risk or undue discomfort to the patient. Organization for emergencies make it possible to carry out the procedure immediately if pulmonary ventilation is suddenly embarrassed. Bronchoscopic aspiration has come to be an indispensable

CLINICAL INVESTIGATION OF PRIMARY MALIGNANCY OF THE LUNG DIAGNOSIS AND OPERABILITY

RICHARD H. OVERHOLT

THORACIC surgery now offers a certain number of patients suffering with primary carcinoma of the lung a chance for recovery. Success is dependent upon the recognition of the lesion while it is still confined to a pulmonary lobe or to one lung. Lobectomy and pneumonectomy are now available and the technic of these procedures is rapidly becoming standardized. Combined effort in well organized thoracic surgical groups in regard to preparation, anesthesia, operative technic and postoperative management has brought the risk of operation well below the prohibitive level. Results to date indicate that a patient has an 80 to 90 per cent chance with lobectomy and pneumonectomy gives better than 65 per cent chance for an operation recovery.¹ Up to the past few years primary carcinoma of the lung was a fatal disease. A five year cure was never known. The use of radium and deep roentgen ray therapy has notably failed to materially alter the clinical course. A patient suffering with cancer in this location is forced to rely on surgery.

The medical profession naturally came to take a fatalistic attitude concerning this disease. Most of our concepts have come from postmortem findings. The hopelessness of the disease tended to dampen interest in anything more than palliative treatment. Recent successes in surgical treatment should now stimulate interest in the early features of primary lung cancer. Our attitude should be (1) to suspect it in the

¹In our series of pneumonectomy cases there have been 8 operative recoveries out of 12 pneumonectomies. Following lobectomy for bronch ectasis 23 out of 25 patients recovered. Lobectomy for carcinoma has been done in two instances with operative recoveries in both patients.

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type in our series did the lesion itself produce a shadow. In all of the other cases in our series, 21 out of 24, atelectasis of one or more lobes was demonstrable by x ray. This means that in all of our proved cases the growth was large enough to occlude one of the major bronchi or was large enough to cast a shadow directly on the roentgenogram. We hope to see

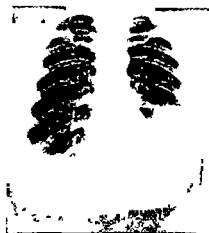


Fig. 261—Preoperative roentgenogram in the case of Mrs. E. H., who was found at this time to have an epidermoid carcinoma in the left main stem bronchus. The lesion completely occluded the lower lobe bronchus and partially occluded the upper lobe bronchus. Note the absence of a shadow cast by the tumor itself. The roentgenogram does show emphysema of the left upper lobe and suggests complete collapse of the lower lobe although the shadow of this lobe is obscured by the heart shadow. The diagnosis was established by bronchoscopy. The patient was operated on May 2, 1934 (left pneumonectomy). She is perfectly well at the present time and shows no evidence of recurrence.

cases in the future who may not even show x ray evidence of a lesion whatsoever. If the condition is suspected before the growth becomes large enough to occlude a bronchus it is quite likely the x ray will be negative. The presence of an infection and a breakdown of pulmonary tissue distal to the lesion is a frequent cause for difficulty in x ray interpretation. Since the roentgenogram so frequently shows the picture of bronchial



Fig 262—Roentgenogram in the case of Mr A T Note atelectas s of both lobes on the left It is impossible to visualize a shadow of the tumor which was found to completely occlude the left main stem bronchus Successful left pneumonectomy was performed on September 9 1936 The patient died of metastatic involvement in February 1937

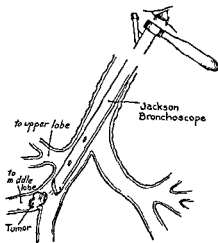
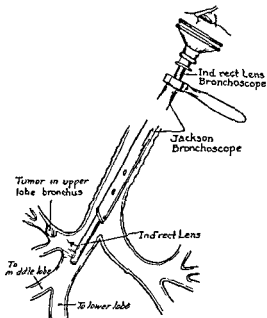


Fig 263—Diagram which illustrates the direct visualization of stem bronchus tumors Sixty five per cent of all primary malignant lesions of the lung can be actually seen and a biopsy obtained

obstruction without actually showing the shadow of the tumor, reliance cannot be placed upon the x ray to positively diagnose early malignancy originating in a stem bronchus (Figs 261, 262). The picture should indicate the next step in the investigation *i. e.*, bronchoscopy.



indirect lens bronchoscope
The instrument is inserted

Fortunately the situation of 65 per cent of primary lung cancers in the major bronchi make it possible to visualize and biopsy them bronchoscopically. In our series of 24 stem bronchus lesions 22 were positively diagnosed by this method (Fig. 263). A lesion in the upper lobe bronchus may not be visible with a Jackson type bronchoscope alone. During the past year we have found a lens telescopic bronchoscope of distinct value in the visualizing of the upper lobe bronchi (Fig. 264). This lens scope is inserted through the Jackson

bronchoscope A magnified image of the interior of the first and second divisions of the upper lobe bronchus can be obtained

In addition to the visualization of the tumor and obtaining a biopsy the bronchoscope gives other valuable information. An exact location of the stem bronchus lesion is necessary in planning the extent of lung resection. Widening of the carina and fixation of the mediastinum indicates the presence of mediastinal glandular involvement. The bronchoscopic dilatation of occluded bronchi may be accomplished and the patient relieved of some of the effects of absorption from retained secretion.

The third diagnostic procedure in stem bronchus lesions is bronchoscopy. A defect in the outline of the major bronchi may give presumptive evidence of a tumor. We have not obtained enough positive evidence of malignancy by this method to consider it at the present time of great value. Any lesion in the major bronchi gross enough to distort the bronchogram should be visible bronchoscopically. In the future with more experience in the interpretation of such films it is quite likely that more reliance can be placed upon bronchography for lesions beyond the range of bronchoscopic visibility.

PERIPHERALLY LOCATED LESIONS

A primary neoplasm arising in one of the smaller bronchi or bronchioles must be located within the substance of the lung itself. An entirely different clinical picture will be produced. None of the factors resulting from bronchial occlusion will be present at an early stage. Cough and hemoptysis may be early symptoms but these symptoms usually come later. Weakness, weight loss and a low grade fever are frequent early symptoms. The x ray is entirely different from that seen in the bronchus occluding type. The lesion itself casts a shadow usually homogeneous at first (Fig 265, A). Later, with necrosis of the center and superimposed infection the shadow is variable. Great difficulty in differentiating tuberculosis or lung abscess may be found. The former can usually

be ruled out by bacteriologic studies. The history and character of the sputum will aid in differentiating pulmonary sup-



Fig 265—*A* Roentgenogram showing the shadow of a peripheral type of tumor in the right lung. *B* Bronchogram of same patient demonstrating the relationship of the lesion to the major bronchi. It is obvious that a tumor so located is not visible bronchoscopically.

puration. Lateral oblique and overexposed roentgenograms are often of value.

The peripheral lesion cannot be visualized bronchoscopically. Lipiodol studies are usually inconclusive although in

some instances the lesion can be better localized in respect to lobes by its use (Fig 265, B)

On rare occasions it is possible to detect malignant cells in the sputum. In the early case, however, we have never established the diagnosis in this way.

Aspiration biopsy may be considered as a possible diagnostic procedure if the peripheral lesion is adjacent to the pleura. A negative result would not rule out malignancy. The puncturing of lung substance and infected areas carries a definite risk. Aspiration of suspicious malignant lesions in the lung should not be generally employed.

The diagnosis of the peripheral type of neoplasm must rest on presumptive evidence and be verified by exploration if metastases cannot be demonstrated.

OPERABILITY

All patients who have proved carcinoma of the lung or who have a presumptive diagnosis of a peripheral type of neoplasm deserve further investigation in respect to operability.

Gross metastasis to the mediastinum can be determined bronchoscopically by noticing the mobility of the trachea. Mediastinal fixation and widening of the carina are quite definite proof of mediastinal involvement. The x ray may also indicate mediastinal widening. A paralyzed diaphragm is good evidence of mediastinal infiltration.

Pleural fluid if such is present should be examined cytologically. Further investigation for pleural metastasis can be made. If pleural fluid is present it can be replaced with air and a thoracoscope introduced. If fluid is not present a pneumothorax can be established. Direct inspection of the visceral and parietal pleural surfaces may provide valuable information.

It is obvious that a biopsy of enlarged cervical glands should be done. In 4 patients under consideration for pneumonectomy in whom no other evidence of metastasis was present a palpable gland was found in the inferior cervical triangle. A positive biopsy contraindicated surgical exploration.

Skeletal roentgenograms should be the next step in deter-

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mining operability In 3 of our cases metastatic lesions were discovered in this way, 1 to the skull and 2 to the scapula

The clinician should not necessarily be discouraged by what appears to be a hopelessly ill patient If metastasis cannot be demonstrated and if the critical condition of the patient is due to an infected lung distal to a blocked bronchus the possibility of surgical treatment need not necessarily be abandoned Bronchoscopic dilatation of the occluded bronchus may result in a remarkably rapid improvement The gradual institution of a pneumothorax with a slow collapse of the involved lung has in many instances been followed by a decided improvement in the general condition of the patient The absorptive area in the lung is reduced The lung is emptied of its secretion The patient becomes adjusted to breathing with the remaining lung and there is also a gradual pulmonary circulatory adjustment Our experience would suggest that the possibility of operative treatment should not necessarily be denied those patients who have marked systemic effects from pulmonary suppuration which is a complication of the primary malignancy The extirpation of the lung not only rids the patient of the tumor but relieves him immediately of the reservoir of septic material

The rational attitude at the present time in regard to primary carcinoma of the lung should be

- 1 To suspect the presence of malignancy in all patients of middle age or past who have obscure chest lesions

- 2 Be aware that the majority of primary cancers of the lung originate in the stem bronchus and that (a) the lesion itself rarely casts a roentgenographic shadow, (b) atelectasis of one or more lobes is the usual x ray picture and (c) bronchoscopy is invaluable in the study of stem bronchus carcinoma

- 3 Realize that peripheral growths may simulate many other pathologic processes and surgical exploration is indicated in questionable cases

- 4 All patients having a primary malignancy in the lung should be investigated to determine operability Indecision and delay mean that the patient throws away his only chance for recovery

BENIGN INTRATHORACIC TUMORS

RICHARD H. OVERHOLT AND CARLTON R. SOUDERS

THE removal of a benign tumor is always a satisfactory procedure for both patient and surgeon because a successful operation is followed by permanent cure. The fundamental characteristics of benign tumors, *i. e.*, encapsulation and lack of invasiveness, limit the problem of excision of tissue to the tumor itself. The adjacent organs usually need not be disturbed. Unfortunately, the location of a benign tumor in an inaccessible situation renders the surgical approach impossible or fraught with great risk. Advances in surgery of the thorax made within the last ten years now permit this region to be opened almost with impunity. Exploration of the thoracic cavity can be undertaken with as little risk as attends abdominal exploration, other things being equal.

This development is the result of three factors. The first of these is a safe and controlled anesthesia. The second is a better understanding of the physiology of the chest and the adoption of these principles during the operation. The third factor which has increased the safety of thoracic operations is concerned with wound closure and postoperative care. Many details which in the past caused trouble are now managed with satisfaction. The function of respiration in the early postoperative period must not be embarrassed. It must be possible for the patient to ventilate all the pulmonary lobes and to empty them of secretion. The collection of pleural fluid on the side of operation must be controlled.

The first of the three factors mentioned has contributed so much to the safety of thoracic exploration that great emphasis must be placed upon it. The use of cyclopropane, an

anesthetic gas which permits high concentrations of oxygen and of the intratracheal catheter which facilitates the aspiration of secretions from the tracheobronchial tree at any time permit a controlled respiration throughout the operative period. The high oxygen concentration insures against anoxemia and thus the factors which caused the alarming symptoms that formerly attended the opening of the pleural cavity are no longer present.

The safety of thoracic exploration at the present time is such that surgical treatment of *benign intrathoracic tumors* is on a par with the treatment of benign tumors located in any other part of the body. It now becomes important first to suspect the presence of such a tumor to establish the fact that it is benign and then to treat it before continued growth has complicated its removal.

Benign intrathoracic tumors are relatively rare. Compared with malignant neoplasms they are considerably less important in point of view of number but are relatively more important because of their operability and curability. It is possible to have any type of tumor originate within the thorax because histologically each of the three primary germinal layers is represented in the embryologic development of the chest and its contents. Histologically benign space taking new growths represent approximately one third of the intrathoracic extra pulmonary tumors.

Included in the benign growths are the following groups: (1) dermoid and teratoma (2) fibroma neurofibroma perineural fibroblastoma and ganglioneuroma (3) osteoma chondroma and osteochondroma (4) myxoma (5) lipoma (6) cystic hygroma hemangioma and lymphangioma. By far the most numerous and most important groups are the first two. We have recently had the opportunity of removing two tumors belonging to the second group and it is our purpose to present these cases and discuss some of the principles involved.

The term perineural fibroblastoma includes any tumor arising from tissues found surrounding nerve fibers and clinically can be enlarged to include the ganglioneuromas which

behave in a very similar manner. These growths are usually found posteriorly in the thorax typically along the gutter between the ribs and vertebrae adjacent to the sympathetic nerve chain. Occasionally they approach the intervertebral foramina and sometimes grow through this opening into the spinal canal when they assume a dumb bell shape and are prone to cause neurologic symptoms since that portion of the tumor then becomes a spinal cord tumor. They are usually pedunculated and tend to grow away from the midline.

These are among the most silent tumors in the thorax and some cause no symptoms whatever. Pain is the most common symptom and is due to pressure on nerves. The location of the pain of course depends on the location of the tumor. Long duration and periods of remission are common findings. Dyspnea is a much less common symptom but is liable to occur if the tumor grows to be very large or if it is high in the chest where early pressure on lung or tracheobronchial tree can occur. Malignant degeneration takes place in some cases. When this happens pain is liable to become very severe and other symptoms related to invasion from the primary growth or to distant metastases make their appearance.

x Ray shows a sharply defined tumor in the posterior mediastinum with a convex border laterally. Because of the occasional occurrence of a long pedicle the mass may rarely lie anteriorly in the chest or at a distance from the spinal column. If there is interspinal extension frequently erosion of the lamina and pedicle of the vertebra can be demonstrated. x Ray is of utmost importance in the diagnosis of this group. The x ray appearance with clearly defined margin serves to distinguish the benign from the malignant or infiltrating type of tumor although inflammatory reaction around one of these growths can closely imitate the picture of an invasive tumor*. The position in the chest which can be accurately determined by x ray in the anteroposterior, lateral and oblique positions is of importance in differentiating lymphomas of all types which make up such a large percentage of mediastinal tumors. The latter are usually centrally located and tend to follow the

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symptom which had been present for two or three days two years before

Physical examination showed a well developed and nourished young woman in no acute distress. There was no cyanosis or clubbing of the fingers. The pupils were equal, round, regular and reacted promptly to light and in accommodation. The chest was symmetrical the trachea in the mid line expansion full and equal bilaterally. In the upper one third of the left lung field was dulness to percussion both anteriorly and posteriorly, and in the same area were dimin



Fig. 267—Case 1. Preoperative film showing the concavity in body of third thoracic vertebra (arrow)

ished breath sounds and vocal fremitus. No rales were heard. The remainder of the examination was normal.

Routine urinalysis was normal. Examination of the blood showed a leukocytosis of 17,950 per cubic millimeter. A differential leukocyte count showed 82 per cent polymorphonuclear neutrophils, 14 per cent lymphocytes, 3 per cent monocytes and 2 per cent myelocytes.

x Ray examination of the chest showed a discreetly out

lymphatic distribution along the tracheobronchial tree while the perineural fibroblastomas lie posteriorly in the chest and are unilateral. A therapeutic dose of x ray is of great value in cases of mediastinal tumor where the diagnosis is uncertain. In a few days the radiosensitive growths will shrink in size while the benign tumors will show no change.

CASE REPORTS

Case I—L. G. a twenty year old single white female was referred by Dr. Leslie B. Copenhaver of North Woodstock, N. H. She had been well until one week prior to her



Fig. 266—Case I. x Ray before operation showing round, clearly defined shadow in left upper thorax. Intrathoracic fibroma.

hospitalization when she was awakened by a sharp pain in the left side of the chest anteriorly which radiated over her shoulder through to her back and down the left arm to the elbow causing numbness of her hand and arm. The pain was present intermittently until the time of her admission. She had had no cough or sputum but there had been moderate dyspnea and palpitation. The past history was negative except for an attack of pain in the chest similar to her presenting

the thoracic cavity. The growth was entirely covered by parietal pleura to which it was densely adherent. The lung could be separated from the pleural covering of the tumor to which it was bound by filmy adhesions. The tumor was attached by a fairly narrow base to the prevertebral fascia at the level of the third vertebra. A slight depression could be felt in the body of the vertebra at the site of the attachment of the tumor. The mass was everywhere encapsulated and

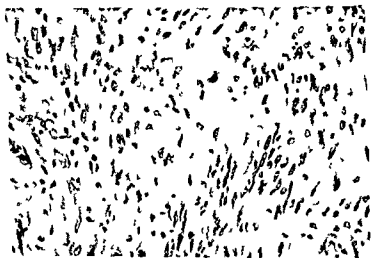


Fig. 269.—Case I. Microscopic section of intrathoracic fibroma showing well-developed fibroblasts and absence of mitotic figures. A blood vessel is shown in the upper left corner.

was removed intact. Bleeding points in the pedicle required ligation. The lung was reexpanded by the anesthetist and the wound closed without drainage. At the conclusion of the operation all possible remaining air was aspirated from the pleural cavity by needle.

Pathology—The specimen was examined by Dr. Shields Warren, whose report was: "The specimen consists of a firm mass $9 \times 8 \times 8$ cm. The surface is smooth, somewhat nodular, delicately encapsulated with numerous fibrous attach-

lined round shadow occupying the left upper thorax and extending downward to the level of the sixth rib posteriorly and across the entire width of the left hemithorax. The body of the third thoracic vertebra was concave on the left, suggesting pressure from a tumor mass. The domes of the diaphragm were smooth rounded and freely movable. The right was opposite the middle, the left opposite the lower margin of the tenth thoracic vertebra. The heart was in normal position. The lung markings were within normal limits.



Fig. 268—Case I. Intrathoracic fibroma after removal.

Operation—On August 12, 1936, intratracheal cyclopropane anesthesia was administered by Dr. Eversole. A left parascapular incision was made and the scapula retracted laterally, thus exposing the posterolateral aspect of the thoracic cage. The fourth rib was subperiosteally resected from the transverse process to the midaxillary line and 1 inch of the third, fifth and sixth ribs were resected posterior to their angles. The pleural cavity was entered by incising the posterior periosteum of the resected rib. A firm tumor about 6 inches in diameter was found occupying the upper portion of

Case II—P C a twenty three-year old, single, white female, was referred by Dr Charles Dolloff of Concord, N H. She had known of a curvature of her spine for at least five years, but had had no symptoms until two years previously when following an automobile accident she developed pain in the dorsal spine. This lasted about a month following which she was well until three weeks before admission, when she



FIG. 271—Case II. X Ray appearance before operation showing the scoliosis and the rounded shadow of the gangliopneuroma lying in the concavity of the thoracic curvature. Note the partial collapse of the bodies of the tenth and eleventh thoracic vertebrae.

began to have pain in the same region following any type of exertion.

Physical examination showed her to be a well nourished young woman in no acute distress. There was a pronounced left dorsal right lumbar scoliosis with the typical chest deformity which accompanies this curvature. Motion of the back was free in all directions without pain or discomfort. The remainder of the examination was negative except for an old right lower quadrant appendectomy scar.

ments The cut surface is smooth, opaque, yellowish gray and glassy with many dull, soft, yellow foci and slightly translucent, gray foci

Microscopic sections show that moderately cellular connective tissue comprises the major portion of this tumor The cells with their plump fusiform nuclei and fairly coarse reticular cytoplasm are readily identified as fibroblasts Mitoses are very rare In the less cellular areas fibroblasts are mixed



Fig. 20—Case I. x Ray appearance seven months after operation. The gaps left by the resected fourth rib and the removal of short segments of the third, fifth and sixth are clearly shown. The lung fields are normal.

with collagen fibers. In other areas there is moderate edema. Blood vessels with well formed thickened walls are numerous.

Diagnosis—Intrathoracic fibroma.

Course—The patient did very well following the operation. The temperature rose to 101° F. on the second day and thereafter was normal. Air and fluid were aspirated from the thoracic cavity on several occasions. She was discharged on her sixteenth postoperative day. Her subsequent course has been uneventful. Seven months after operation she was entirely without symptoms and x ray examination of the chest showed the lung fields to be normal in appearance.

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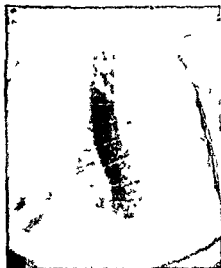


Fig 271—Case II x Ray appearance before operation showing the scoliosis and the rounded shadow of the ganglioneuroma lying in the concavity of the thoracic curvature. Note the partial collapse of the bodies of the tenth and eleventh thoracic vertebrae.

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Routine urinalysis was normal. The blood showed a leukocytosis of 12,300 per cubic millimeter. The differential leukocyte count showed 71.5 per cent polymorphonuclear leukocytes, 19.5 per cent lymphocytes, 5 per cent monocytes and 4 per cent eosinophils.

Roentgen examination of the spine showed a fairly marked scoliosis with partial compression of the tenth, eleventh and twelfth dorsal bodies, especially on the right half. Lying in



Fig. 272—Case II. Ganglioneuroma after removal.

the concavity was a fairly well outlined shadow which extended just above the diaphragm and lateral to the spine. Films of the chest showed the lungs to be clear with the exception of the shadow at the right base partly obscured by the heart shadow.

Neurologic examination by Dr. Poppen was normal and a lumbar puncture done to rule out the possibility of interspinal extension of the tumor showed normal pressure and no evi-

dence of subarachnoid block. Examination of the clear, colorless fluid revealed no cells. The total protein was 50 mg per cent, the Wassermann and colloidal gold curve were negative.

Operation—August 15, 1936. Intratracheal cyclopropane anesthesia was administered by Dr Eversole. An incision was made over the right ninth rib. The paraspinalis muscles were retracted medially and the ninth rib was resected from the transverse process to the midaxillary line. One and one half



Fig. 273—Case II. Tumor after removal showing the cut surface. The darker area in the left half is a focus of slight hemorrhage.

inches of the eighth, tenth and eleventh ribs were subperiosteally resected near the transverse processes. The pleura was opened and a tumor mass 4 inches in diameter lying in the angle between the diaphragm, lung and pericardium was exposed. This tumor was outside the endothoracic fascia and parietal pleura so that it was necessary to cut these two structures. It was found to have a small avascular pedicle coming from between the ribs at the level of the transverse processes,

Routine urinalysis was normal. The blood showed a leukocytosis of 12,300 per cubic millimeter. The differential leukocyte count showed 71.5 per cent polymorphonuclear leukocytes, 19.5 per cent lymphocytes, 5 per cent monocytes and 4 per cent eosinophils.

Roentgen examination of the spine showed a fairly marked scoliosis with partial compression of the tenth, eleventh and twelfth dorsal bodies, especially on the right half. Lying in



FIG. 272.—Case II. Ganglioneuroma after removal.

the concavity was a fairly well outlined shadow which extended just above the diaphragm and lateral to the spine. Films of the chest showed the lungs to be clear with the exception of the shadow at the right base partly obscured by the heart shadow.

Neurologic examination by Dr. Poppen was normal and a lumbar puncture done to rule out the possibility of interspinal extension of the tumor showed normal pressure and no evi-

dence of subarachnoid block. Examination of the clear colorless fluid revealed no cells. The total protein was 50 mg per cent, the Wassermann and colloidal gold curve were negative.

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Fig. 274—Case II. Microscopic section of ganglioneuroma. This area shows the large oval round or pear-shaped multinucleated ganglion cells.

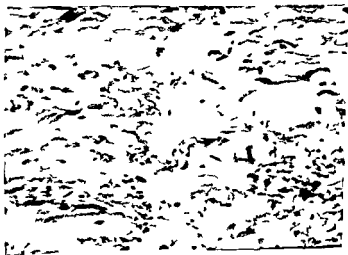


Fig. 275—Case II. Ganglioneuroma. This section shows fine wavy fibrillar tissue resembling that seen in peripheral nerves.

but not attached to the bone. The patient had a very mobile mediastinum so that even with intratracheal anesthesia there was considerable shift and inadequate oxygen exchange. This resulted in a drop of blood pressure and elevation of pulse so that the chest had to be closed two or three times to permit restoration of normal function. The tumor was removed without difficulty. The wound was closed without drainage, the lung being fully expanded by the anesthetist before the pleura was closed.

Pathology—The specimen was examined by Dr. Shields Warren whose description is as follows: the specimen consists of a mass of tissue $11.5 \times 7.5 \times 4$ cm. found to be covered with a soft, smooth, fairly dense capsule. The surface of the mass is in places irregular but well circumscribed. Its consistency varies from rubbery to quite firm. The surface appears smooth, homogeneous, pearly gray, opaque, glassy and contains numerous areas of apparent marked fibrosis. The center of the mass contains a focus of slight hemorrhage and a dense fibrous area. There is a watery fluid exuding from the surface.

Microscopic section showed that the tumor is composed of (1) large oval round or pear shaped multinucleate cells typical of ganglion cells and (2) fine wavy fibrillar tissue resembling that seen in peripheral nerve. The ganglion cells occur both singly and in groups of nearly 40 cells. The some times closely packed and sometimes edematous fibrillar tissue in which the large ganglion cells lie forms irregularly inter twining bundles. In these delicate membranous tubular structures resembling Schwann's sheaths enclose fine cylindrical fibers which suggest axones. Parts of the tumor show fibro blasts with long narrow angulated nuclei and associated collagen indicating the presence of perineural connective tissue. Through the tumor course numerous small veins and arteries with well formed partially hyalinized walls.

Diagnosis—Ganglioneuroma.

Course—During the first three postoperative days the patient had marked tachypnea with a respiratory rate of 60

to 90 per minute. This was relieved on several occasions by the aspiration of air from the right pleural cavity. She was discharged in good condition on the twentieth postoperative day.

COMMENT

Case I clearly illustrates how silent even a large benign intrathoracic tumor can be. The two or three days of mild symptoms two years before indicate that the growth had been present at least that long. Her presenting symptoms at their worst were not very severe and it was rather surprising to find such a large tumor when x ray was taken. No explanation for the leukocytosis had been found. It is of interest that both these patients had a moderate elevation of leukocyte count without other evidence of infection. The x ray picture of the tumor was absolutely typical. Pressure of the mass caused a depression in the body of the vertebra and was easily distinguished from the erosion of the lamina which is caused by an intraspinal type of tumor. The tumor was solid and encapsulated and was removed with ease. The short pedicle is typical of these growths in the posterior chest.

Case II shows also a long period without symptoms. This case presented certain difficulties in diagnosis. The role played by the automobile accident is somewhat doubtful. The presence of a long standing scoliosis and the development of pain suggested the possibility of tuberculosis of the spine with the shadow of the mass seen by x ray representing an atypical tuberculous abscess. However the scoliosis did not cause any limitation in motion of the spine; there were no signs of infection; the tuberculin test was negative and the shadow to the right of the spine was felt to be too discrete to be an abscess so it was thought more likely that the pain was due to a tumor and entirely unrelated to the curvature. It was felt advisable to be absolutely certain that there was no intraspinal extension so the lumbar puncture was done. This patient's mediastinum was so mobile that there was a marked shift even with the closed anesthetic system which resulted in an inadequate ex-

pansion of the opposite lung and insufficient exchange of air. The result was a drop in blood pressure and elevation of pulse to a degree that required closing the chest cavity for a few minutes whereupon they would almost immediately be restored to normal and the operation could be resumed. Spontaneous respirations were absent throughout most of the operation. Only by reason of the control which intratracheal closed system anesthesia gives was it possible to bring the operation to a successful close.

The tachypnea which occurred in the first few postoperative days while rather distressing to the patient seemed to have no serious effect upon the physiology of the chest. It was probably exaggerated by the structural deformity of the thorax produced by the scoliosis.

These cases illustrate the necessity for x ray in the diagnosis of benign intrathoracic tumors, the safety of operation and the cure which may result.

THE USE OF UNPADDED CASTS WITH WALKING IRONS IN FRACTURES BELOW THE KNEE

GILBERT E. HAGGART AND GEORGE G. BAILEY

UNPADDED plaster casts with walking irons incorporated for weight bearing have been in use for years, but only recently have they come into general favor in this country due largely to the influence of Bohler in Vienna. When judiciously em-



Fig. 276.—Padding applied. Felt cut around condyles of tibia. Strip of thin felt over toes.

ployed and correctly applied they are safe and comfortable, and offer several advantages over the ordinary padded plaster boot. We will speak only of their use below the knee, because it is here that they are most satisfactory and easy to apply.

Technic of Application.—If there is much edema, the application should be delayed for several days until it has been controlled by continuous elevation of the extremity. Slight edema may be massaged out at the time of applying the cast. The skin is not shaved.

The patient lies supine with the leg flexed over the end of the table, which is elevated sufficiently so that the patient's foot can rest on the knee of the surgeon seated on a chair. This gives better control of the leg and facilitates the reduction of the fracture and the application of the plaster.

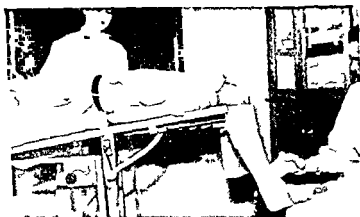
A felt cuff about 3 inches wide is placed around the tibial condyles just below the knee (Fig. 276). A second narrow thin piece of felt is placed over the dorsal aspect of the base of the toes to permit later trimming of the plaster. Three inch wide plasters are used as wider bandages are prone to wrinkle and are difficult to handle. Reverses and bandages should be very wet and sloppy. A stirrup reverse is first applied around the bottom of the heel and up the lateral aspects of the leg to the knee (Fig. 277 A). This is gently molded to the leg and is immediately held in place by one layer of a circular plaster running from the knee down to just above the ankle (Fig. 277 B). While the latter is applied wrinkling of the reverse is prevented by an assistant who pulls gently upward on the ends of the reverse at the knee. This may be done by the patient if he is not anesthetized.

As soon as this first stirrup reverse is in place a posterior reverse is applied extending from the knee to just beyond the tips of the toes and is carefully molded to the leg, foot and ankle. The plaster is then completed by 2 or 3 circular bandages extending from the toes to the knee. In applying the latter extreme care must be used not to exert tension on the bandages but to simply roll them on without tension and without creases. The only place the plaster should be applied tightly is around the felt cuff at the knee. Here a snug fit is safe and in fact necessary to prevent the top of the cast from becoming loose.

The walking iron is now to be applied. This is composed of slightly flexible steel with a broad rubber bottom piece (Fig. 278). The iron is then bent to conform to the shape of the cast and care is taken that it does not dent the plaster at any point. The walking iron is incorporated into the plaster with 1 or 2 circular bandages. The iron should project below the



A



B

Fig 277—A Illustrating position of patient with knee flexed over table foot resting on surgeon's knee. Stirrup reverse held taut by assistant while molding is done by operator. B The stirrup reverse is held in place by a plaster bandage applied without tension.

heel so that the toes will clear the ground in walking (Fig 279)

If there is any danger of swelling the leg should be elevated and the circulation of the toes carefully watched for the

next few hours. In any event walking on the cast is postponed for forty-eight hours to allow the plaster to dry thoroughly. Crutches should not be allowed as they will delay use of the walking iron. The patient is encouraged to walk as normally as possible with the plaster.

Indications—1 *Fresh Fractures*—The greatest field of usefulness for this type of plaster is in fractures about the ankle



Fig. 278. Type of steel walking iron employed. Note the wide rubber bottom piece. The uprights may be bent to conform to the shape of the cast.

and in the lower third of the tibia. They are ideal in simple fractures of the external malleolus which ordinarily exhibit very little swelling. When used for the bimalleolar type of ankle fracture it may be necessary to delay application for a few days in order to control edema. The latter is especially prone to occur in the presence of backward displacement of the foot and fracture of the posterior margin of the tibia. An

unpadded cast may also be successfully employed in transverse fractures of the lower third of the tibia and displacement of the lower tibial epiphysis but is not applicable to the common oblique fracture of the lower tibia because the fragments will slip by one another

2 *Delayed Union in Fractures of Mid and Distal Thirds of Tibia and Fibula*—Unpadded casts may be employed in



Fig 279—Completed cast with walking iron incorporated. The iron projects below the cast to allow the toes to clear the ground in walking

any transverse fracture of this type. In oblique fractures with delayed union care must be taken that there is enough fibrous union to prevent overriding of the fragments when weight is borne. Weight bearing in this manner stimulates callus formation and at the same time allows the patient to be ambulatory without crutches. Many cases of delayed union can be saved from operation by this procedure.

Contraindications—Excessive swelling of the soft tissues contraindicates an unpadded plaster. Many of these cases should be treated by elevation in a temporary pillow and side splint for two or three days before the cast is applied. Slight edema may be massaged out at the time of application.

Any laceration or skin abrasion is reason for postponing use of plaster against the skin.

Oblique fractures are not suitable for weight bearing unless there is union of sufficient degree to prevent telescoping of the fragments.

Youth of the patient is not a contraindication. In general children get about on the walking iron with great dexterity.

Advantages—Crutches are dispensed with, a great advantage to the man who must carry on a business, or the woman who is thereby enabled to do her housework. Patients are almost universally pleased with this method and take delight in showing their friends how they can walk on a broken leg.

The unpadded plaster holds the fragments securely without the danger of subsequent displacement which sometimes occurs with the padded cast. This applies also to children who are very apt to discard their crutches and walk directly on the plaster. This may do real damage if the plaster is of the padded variety.

The use of the leg keeps the muscles from wasting and prevents much of the joint stiffness commonly observed when the limb is not active.

Early union of the fragments is promoted by weight bearing. The use of this method for stimulating callus in cases of delayed union has been mentioned above.

PRESACRAL NEURECTOMY IN THE TREATMENT OF DYSMENORRHEA

SAMUEL F. MARSHALL AND JAMES L. POPPEN

RESECTION of the presacral nerve for the relief of painful menstruation has definitely proved itself as a well established surgical procedure. Since Cotte,¹ 1925, described the anatomy of the sympathetic nervous system of the pelvis in the female as well as the technic used in interrupting the afferent fibers by section of the presacral plexus, many reports have appeared in the literature corroborating his results in patients who suffered from dysmenorrhea. As early as 1898 Jaboulay had divided the sacral sympathetic fibers by a posterior approach in a successful endeavor to relieve pelvic pain.

Dysmenorrhea is a frequent complaint and at times is a disturbing problem to the surgeon. Since the causes are many, a thorough search for them must be made so that all the evident organic local abnormalities may be eradicated. Various forms of treatment for dysmenorrhea have been proposed many of which have been disappointing. A few individuals thus afflicted bear their complaints in silence, in the belief that it is the cross they must bear. Others who are emotionally unstable greatly magnify their complaints thus making a true estimate of their real amount of discomfort extremely difficult. In the individual case after a thorough physical examination and before surgical methods are instituted it is necessary that we first employ all the conservative measures such as general physical hygiene, antispasmodic drugs, endocrine therapy or psychotherapy as seems indicated.

The use of organotherapy has been too recent to estimate its true value but as yet, except in an occasional case, the

results have not been promising. Dilatation of the cervical canal and curettage of the uterus is of value in correcting local disorder. There are, however, a few young patients in whom the pain has proved so intractable to the more conservative methods of treatment that hysterectomy has been proposed and willingly accepted in an effort to obtain relief. It cannot be too strongly emphasized that all conservative measures which seem indicated should be given a fair trial before operative procedures are carried out. Nevertheless the results obtained from a resection of the presacral plexus justifies its use in the severe cases of dysmenorrhea. At the present time there is rarely any justification for hysterectomy, irradiation or x ray treatment for the relief of the pain associated with menstruation.

Two types of dysmenorrhea have been described by Counseller and Craig.⁷ Primary dysmenorrhea is characterized by the absence of a pathologic condition in the pelvic organs it occurring most commonly in young women in whom pelvic examination will seldom disclose any abnormality with the possible exception of a moderately underdeveloped uterus which may be slightly ante flexed. Presacral neurectomy appears to be the most valuable in these patients. Secondary dysmenorrhea is characterized by a demonstrable pathologic condition in the pelvis such as endometriosis, salpingitis, ovarian tumor, fibromyomata and various types of malposition of the uterus. In many of these individuals a presacral neurectomy is a useful procedure and in some cases should be performed at the same time that the pelvic disorder is corrected since it does not add greatly to the time or risk of the operation. Young women with mild or moderate degrees of endometriosis can often be relieved by presacral neurectomy plus a conservative pelvic operation without the necessity of surgical castration. Any malposition of course should be corrected at the time the neurectomy is performed and a dilatation and curettage should always be done.

Pelvic pain associated with inoperable carcinoma of the pelvis may be relieved for long periods by extensive presacral

plexus resection and for several years Lahey and Cattell have advocated resection of the presacral nerve in extensive tumors of the rectum which are borderline operable cases and likewise with inoperable carcinomas of the rectum with favorable results. However, because of pain extending higher up than the pelvic region many of these individuals eventually have had to be subjected to either alcohol injection or cordotomies in order to obtain complete relief from their pain.

Craig and also Douglass,³ have reported relief of pain from presacral nerve resection in cases of interstitial cystitis but in our experience we have noted no worthwhile relief of symptoms in these cases which we have submitted to the procedure. Ovarian pains are unaffected by the resection of the presacral nerve because they are supplied by the ovarian plexus which originate from aortic renal and celiac ganglia. Various authors have reported cases of pruritus vulvae dysuria and vaginismus as being relieved by this procedure.

All the writers and investigators upon the subject are in agreement that presacral nerve resection does not interfere with sexual intercourse menstruation or parturition as it does not interfere with uterine contractions many having reported normal pregnancies following this operation.

Since the detailed anatomy of the presacral plexus has been described frequently and fully no attempt will be made here other than to give the necessary surgical features briefly the presacral plexus originates from the anastomosing sympathetic fibers from the aortic plexus and lumbar chains forming well defined fibers just distal to the origin of the inferior mesenteric artery. These fibers have a tendency to separate into two strands lying on the lateral borders of the upper part of the arch of the bifurcation of the aorta. These two strands usually interlace as the aorta divides into a well formed plexus ranging from a few thin fibers to a dense network. The length of this plexus also varies but usually is not more than 5 cm when it again divides into two main trunks (hypogastric nerves) the left lying close to the left iliac vein and in the majority of our cases was the larger. The right courses well

medial to the right iliac artery. The entire structure is a well defined unity lying in fairly thin subperitoneal areolar tissue.

The actual technic for the removal of a sufficient portion of the presacral distribution of sympathetic fibers is not difficult if care is taken in keeping a bloodless field. Furthermore

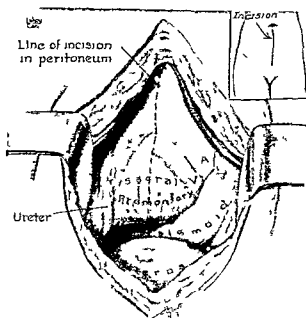


Fig. 280.—The abdominal wall incision is shown, the intestines are retracted, and the line of incision in the posterior peritoneum is illustrated.

it can be done in a relatively short time so that it can be supplemented to other gynecologic procedures that seem indicated at the time of the laparotomy. A suprapubic midline abdominal incision is made. The upper end should extend to the umbilicus since an adequate exposure of the bifurcation of the aorta is essential to be able to expose the plexus properly. After the peritoneal cavity has been opened, a thorough abdominal

exploration is made. The patient is then placed in the Trendelenburg position, the upper abdominal cavity walled off with moist saline packs. The rectosigmoid colon is retracted laterally, the posterior peritoneum is then grasped about 2 cm below the bifurcation of the aorta and incised (Fig. 280). If

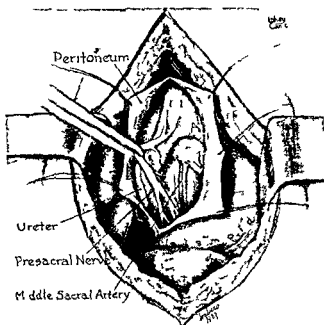


Fig. 281—This shows the posterior peritoneum incised and the edges of the peritoneum elevated with sutures of silk. The presacral nerve is dissected free from the areolar tissue and retracted with a tape before the nerve is resected.

the peritoneum has been kept at a slight tension at the time it is opened, it will be noted that the retroperitoneal space immediately fills with air. It is then opened longitudinally, the upper end extending just above the bifurcation of the aorta, the lower approximately 5 cm below, care being taken that none of the retroperitoneal tissue is included in the

medial to the right iliac artery. The entire structure is a well defined unity lying in fairly thin subperitoneal areolar tissue.

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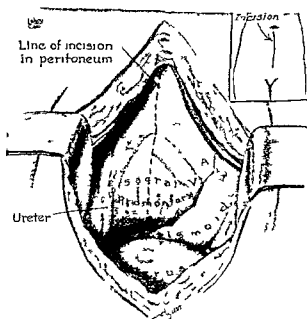


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old scar and many adhesions were released previous suspension was found to be insufficient. The uterus was again suspended by the Gilliam technic and presacral nerve resection was performed. Recovery was uneventful with patient discharged from hospital upon the fourteenth postoperative day. Three months later reported complete relief from all menstrual pain and no loss of time from work.

Case II—Miss I. T. white aged twenty six came to clinic complaining of severe menstrual pain of two and one half years duration. Onset of pain three to four days before each period and continuing throughout menstruation for three to five days. Had become extremely nervous because of recurrent pain each month. loss of appetite. loss of 20 pounds in two and one half years. Pain required morphine to relieve and patient confined to bed each month. All types of conservative measures had been tried without relief. Pelvic examination found to be negative except for small ante flexed uterus.

Operation—Dilatation of uterus revealed normal cervical canal. Presacral neurectomy was performed through a mid line suprapubic incision. pelvic organs found to be normal. Uneventful convalescence followed operation and patient was discharged on the fifteenth postoperative day in excellent condition. A recent report from patient regarding menstrual pain states: "I did not undergo any of the abdominal pain which I have been subjected to for the past two and one half years. the future and life itself seems much brighter now."

These 2 cases are typical of severe dysmenorrhea without relief from other measures in whom complete relief of symptoms was obtained by presacral nerve resection.

Case III—Mrs. L. B. white aged forty four came to the clinic complaining of pain accompanying urination and frequency over a period of seventeen years. for past four years pain had become increasingly severe and various types of treatment had given no relief. Cystoscopic examination re-

primary peritoneal incision since there are multiple capillaries which ooze and stain the field with blood. The edges of the peritoneum are kept separated and elevated with guide sutures of black silk (Fig 281). The loose areolar tissue is then gently grasped brushed aside in the midline just at the bifurcation of the aorta exposing the plexus. The latter can then be lifted up with a nerve hook or forceps and a tape may be inserted under it for retraction. The areolar tissue is then wiped from the plexus with cotton or gauze pledgets using blunt dissection upward to the inferior mesenteric artery where the fibers are coagulated with electro-surgical unit or divided between clamps and the proximal end ligated. The distal end of the divided nerve is then lifted and the dissection carried down from behind. It is well to divide this areolar tissue lying between the hypogastric nerves into which the plexus divides making it simpler to expose them separately by means of blunt dissection carrying it down on the left to a point where it disappears beneath the left iliac vein on the right to a corresponding length where they are divided. All bleeding points are carefully controlled and the peritoneum closed with continuous fine catgut sutures. Care must be taken in avoiding injury to the left iliac vein sacral artery and the right ureter.

CASE REPORTS

Case I—Miss L. B. white aged twenty eight came to the clinic complaining of severe menstrual pain of eight years duration. Periods since onset of menses were always accompanied with distress but were relieved by various drugs. During the past five years she was incapacitated from three to five days each month confined to bed with pain nausea and vomiting beginning two to three days prior to the onset of each period and lasting one to two days after onset of menstrual flow. Seven months before admission had had dilatation of the cervical canal and suspension of the uterus without relief since operation had required morphine for menstrual pain.

Operation—Suprapubic midline incision was made through

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vealed the typical irritable bladder of an interstitial cystitis with a markedly decreased bladder capacity. Dilatation of the bladder was done at intervals by Dr. Hicks of the urologic section over long periods of time with relief early in course of treatment but symptoms gradually became more severe.

Presacral neurectomy was proposed. Operation was submitted to and a resection of the presacral nerve was performed through a midline suprapubic incision. Following operation the patient's bladder symptoms continued unchanged and pain and frequency occurred with the same intensity. This case is illustrative of failure to relieve pain from interstitial cystitis by neurotomy and we have had a similar experience with 2 other cases of this type.

We have performed presacral nerve resection in 15 cases during the past two years (1935-1936) 10 of which were done for menstrual pain. The other 5 patients had removal of the presacral nerve for relief of pelvic pain of a different origin and none of these cases have received any benefit from the operation. The results in the cases complaining of dysmenorrhea have been excellent all patients reporting complete relief from menstrual pain. In some of the cases the improvement in general health has been striking. With cessation of pain there has been weight gain, improvement in mental state and marked decrease in nervous manifestations. Four patients had only a presacral nerve resection, no other pelvic surgery being done. 6 cases had suspension for mild degrees of displacement of the uterus in addition to removal of the presacral nerve.

SUMMARY

Presacral nerve section offers definite relief to patients with disabling and distressing dysmenorrhea.

Conservative measures should be used before advocating presacral nerve section.

A brief description of the surgical anatomy and technic of resection of the presacral plexus is given.

Illustrative case reports are cited with a brief discussion of results obtained.

CUMULATIVE INDEX

- AARON s s gn in chron c append cit s
Feb 115
- Abdominal surgery morphine in clin
ical value June 773
- ptressin in clinical value June
773
- Ablatio placentae April 427
complicat ng eclamps a treated
w th bag April 425
- Ychalias a June 604
- Adenomatous s of colon June 859
- Adhes ons following operat on for
fracture of patella April 358
- Agger nasi April 397
cells April 406
- Alkal s corrosive burns of oral cavity
and esophagus April 588
- Ambulant treatment of reducible her
nia April 513
- Amebias s w th carcinoma of colon
June 853
- Amniot c sac contents aspiration of
by newborn Feb 45
- Anastomos s intestinal April 489
- Anesthes a complications Feb 83
anesthetist Feb 85
management Feb 83
operation Feb 85
pat ent Feb 84
types Feb 86
for gastro intest nal surgery June
655
- n *
- sp
- Angi a pt u s c i u c append citis
and Feb 134
gastro intest nal symptoms and
June 721
- Anorectal fistula Feb 279 June 871
- Antrum of Highmore anatomy
April 400
- Apertura p riformis April 400
- Append citis asthmatic que Feb 133
chronic Feb 107
Aaron s s gn Feb 115
angina pectoris and Feb 134
associated w th peptic ulcer and
gallbladder disease Feb 140
Bastedo s s gn Feb, 115
- Append citis chronic carcinoma of ce
cum and differentiation Feb
130
card ospasm due to Feb 134
diagnosis approach to Feb 114
gastro intestinal symptoms Feb
135
Held s s gn Feb 116
ileitis and differentiation Feb
131
mesenter c lymphaden tis and
differentiation Feb 119
mucocoele of append x and differ
entiation Feb 118
multiple diverticul t s and differ
entiation Feb 118
myxoglobulos s of append x and
differentiat on Feb 118
Reder s s gn Feb 115
Rovs ng s sign Feb 115
s mulating d sease of gallbladder
Feb 139
peptic ulcer Feb 138
symptoms Feb 116
infectious Feb 140
local Feb 119
tuberculosis of ileocecal reg on
and differentiation Feb 130
with reflex symptoms Feb 133
epileptique Feb 133
hystérique Feb 133
- to female generative organs Feb
125
to ileac coils Feb 127
to omentum and cecum Feb 120
to retrocecal region Feb 124
to sigmoid Feb 127
to urinary bladder Feb 125
- anatomy Feb 109
arterial supply Feb 111
lymphatics Feb 110
mucocoele of chronic appendicitis
and differentiation Feb 118
myxoglobulos s of chron c appen
d c t s and differentiation Feb
118

- Cesarean section abuses *Feb 3*
 uses *Feb 3*
 Chemical burns of oral cavity and
 esophagus *April 585*
 Cholecystectomy technic *June 731*
 Choledochostomy technic *June*
 Cholelithiasis earlier operator
 June 725
 Coccygodynia manipulative
 manipulative *Feb 70*
- Diverticula of gastro intestinal tract
 June 779
 Diverticulitis multiple chronic ap
 pendicitis and differentiation *Feb*
 118
- therapy in bronchiectasis *Feb Feb 1* manifestations of gastro
 197
- Concha nasalis anatomy *April*
 inferior anatomy *April 39*
 medial anatomy *April 396*
 Congestive heart failure gastro-in
 testinal symptoms and *June 723*
 Contracted pelvis management of
 in contracted pelvis *April 433*
 Convulsions ether *Feb 91*
 Coronary arteries disease of
 intestinal symptoms and
 721
 Corrosive alkalies burns of oral
 and esophagus *April 588*
 Courvoisier's law *June 755*
 Couvelaire uterus *April 427*
 Craniiform plate *April 406*
 Crucial ligaments rupture of *April*
 381
 Cystocele surgical repair *Feb 59*
- Esophagus and oral cavity chemical
 burns *April 585*
 carcinoma of *June 615*
 neuromuscular conditions *June*
 618
 peptic ulcer *June 614*
 stricture of *June 613*
 web of *June 611*
 Ether convulsions *Feb 91*
 Ethmoidal cells *April 407*
- Recurrent of patella *April 350*
 Traumatic of patella *April 350*
- Fecal fistula surgical management
 June 787

- Appendix nerve supply, *Feb* 111
 pathology *Feb* 109
 position *Feb* 111
 Arteries of nasal cavities *April* 409
 Arthritis traumatic *April* 363
 Asphyxia of newborn *Feb* 41
 Aspiration bronchoscopic prevention
 and treatment of postoperative
 pulmonary complications by
June 885
 of amniotic sac contents by new
 born *Feb* 45
 Atelectasis of newborn *Feb* 42
 Atrium meatus media *April* 397
 Atrophy of bone acute following op-
 eration for injured semilunar car-
 tilage *April* 355
- Back pain low with sciatica diag-
 nosis and treatment *Feb* 251
- Blood transfusion in lobectomy for
 bronchiectasis *Feb* 210
 Bone atrophy acute following opera-
 tion for injured semilunar cartilage
April 355
 Breasts care of in pregnancy *Feb*
 27
 engorgement of *Feb* 29
 postpartum care *Feb* 28
 Bronchiectasis bronchoscopic exam-
 ination in *Feb* 196
 compression therapy *Feb* 197
 diagnosis *Feb* 194
 lobectomy for *Feb* 191
 blood transfusion *Feb* 210
 closure *Feb* 209
 drainage *Feb* 208
 postoperative treatment *Feb*
 210
 pathology *Feb* 192
 phrenectomy in *Feb* 197
 postural drainage in *Feb* 195
 preoperative treatment *Feb* 196
 Bronchoscopic aspiration prevention
 and treatment of postoperative
 pulmonary complications by
June 885
 examination in bronchiectasis *Feb*
 196
 Brown Sequard syndrome *April* 50
 Bulla ethmoidal cells *April* 407
 ethmoidals *April* 397
- Burns chemical of oral cavity and
 esophagus *April* 585
- CANINE eminence *April* 402
 Carcinoma of cecum chronic appen-
 dicitis and differentiation *Feb*
 130
 of colon amebiasis with *June* 853
 x ray treatment *June* 865
 of digestive tract in young *June*
 815
 of esophagus *June* 615
 of lower lip *Feb* 297
 of lung primary diagnosis *June*
 895
 operability of *June* 895 903
 of pancreas *June* 753
 of rectum *June* 871
 x ray treatment *June* 865
 of stomach *June* 677
- semilunar anatomy of *April* 315
 derangements of *April* 315
 clinical considerations *April*
 318
 diagnosis *April* 327
 differential *April* 327
 prognosis *April* 328
 treatment *April* 323
 external congenital abnormal-
 ities *April* 331
 injured acute bone atrophy fol-
 lowing *April* 355
 operation for removal hemor-
 rhage following *April* 360
 Casts unpadded with walking irons
 use of in fractures below knee
June 921
 Cavum nasi anatomy *April* 393
 Cecum carcinoma of chronic appen-
 dicitis and differentiation *Feb* 130
 Cells agger nasi *April* 406
 bulla ethmoidal *April* 407
 ethmoidal anatomy of *April* 404
 407
 frontal recess *April* 401
 infundibular *April* 407
 Cervical spine dislocations of treat-
 ment *April* 543
 fractures of treatment *April* 543
 giant cell tumor *Feb* 213
 Cervix lacerations of surgical repair
Feb 64

- Knee joint fracture of adhesions following operation for April 358
ununited April 348
injuries of complications following April 355
ligament of rupture April 345
operations on complications following April 355
lateral ligaments April 345
- LABOR management
pelves April
prolonged April
Labyrinth et April 404
- L
- lower surgical repair Feb 35
Lacrimal apparatus
- Ligamentum patellae rupture of April 345
Lumen nas April 400
Lip lower carcinoma of Feb 297
epithelioma of Feb 297
malignancy Feb 297
potential malignancy Feb 297
Lobectomy for bronchiectasis Feb 191
blood transfusion Feb 210
closure Feb 209
drainage Feb 208
postoperative treatment Feb 210
Low back pain with sciatica diagnosis and treatment Feb 251
Lung carcinoma of primary diagnosis of June 895
operability of June 895 903
Lymphadenitis mesenteric chronic appendicitis and differentiation Feb 119
Lymphatics of nasal fossa and sinuses April 409 410
- MALIGNANCY
- Malignancy potential of lower lip Feb 297
Mastitis prevention and management Feb 27
Maxillary sinus anatomy April 400
Meatus inferior anatomy of April 396
middle April 397
nasal supreme April 399
- Milk leg management Feb 22
- Myxoglobulosis of appendix, chronic appendix and differentiation Feb 118
- Nares anterior anatomy of April 400
posterior April 400
Nasal accessory sinuses anatomy April 400
surgery April 393 412
anesthesia in April 411
preoperative details April 413
x rays of April 415
cavity anatomy April 393
fossae anatomy April 393
infundibulum April 397
meatus supreme April 399
sinus disease nervous system symptoms from Feb 213
suppuration pathology April 411
wall external anatomy of April 395
Nerve supply of nasal fossa and sinuses April 409 410

- FEMORAL epiphysal distal tumor of, *April 376*
 Femur adhesion of quadriceps muscle to *April 341*
 Fistula anorectal *Feb 279 June 871*
 fecal surgical management *June 787*
 Fistula in ano *Feb 279*
 Foramen caecum *April 406*
 infra-orbital *April 402*
 Fossa incisive *April 402*
 nasal anatomy of *April 393*
 Fractures below knee use of unpadded casts with walking irons in *June 921*
- Hemorrhage late of pregnancy *April 417*
 postpartum *April 428*
 delayed *April 430*
 immediate *April 430*
 succenturiate lobe *April 429*
 Hernia reducible ambulant treatment *April 513*
 Hiatus maxillaris *April 401*
 semilunaris *April 398*
 Highmore antrum of, anatomy *April 400*
 Hydrochloric acid burns of oral cavity and esophagus *April 587*
- united *April 343*
 Frontal recess cells *April 407*
 sinuses anatomy of *April 403*
 Frost bite *Feb 301*
- GALLBLADDER disease of chronic appendicitis complicating *Feb 139*
 diabetes and *June 743*
 Gallstones diabetes and *June 743*
 earlier operations in *June 725*
 Gastrectomy subtotal dietary care after *June 717*
 place of Billroth I c - - - *June 667*
 postoperative complication *June 705*
 Gastric resection techniques *June 693*
 Gastrointestinal surgery anesthesia for *June 655*
 symptoms in heart disease *June 721*
 of chronic appendicitis *Feb 139*
 tract of verticulae of *June 719*
 Genu valgum deformity and growth arrest as result of trauma *April 378*
 Giant-cell tumor of cervical spine *Feb 243*
- HEART disease gastro-intestinal symptoms in *June 721*
 failure congestive gastro-intestinal symptoms and *June 723*
 Held sign in chronic appendicitis *Feb 116*
 Hematomyelia traumatic *April 570*
 Hemorrhage following removal of semilunar cartilage *April 360*
 intracranial of newborn *Feb 48*
- Ileocecal region tuberculosis of chronic appendicitis and differentiation *Feb 130*
 Ileostomy for intractable ulcerative colitis *June 803*
 Incisive fossa *April 402*
 Industrial neuroses diagnosis *April 537*
 treatment *April 537*
 Infantile paralysis correction of deformities of lower extremity in *Feb 227*
 Infection and epiphysolysis *April 319*
- Intrathoracic tumors benign *June 905*
 Irons walking use of unpadded casts with in fractures below knee *June 921*
 Irradiation treatment of benign lesions of female pelvis *April 465*
- KNEE epiphysal cartilages about lesions of *April 373*
 extensor apparatus lesions of *April 341*
 fractures below use of unpadded casts with walking irons in *June 921*
 joint dislocation of congenital lateral *April 351*
 recurrent *April 350*
 traumatic *April 350*
 fracture of *April 345*

- Pruritus ani *June 845*
 causes *June 845*
 diagnosis *June 847*
 idiopathic *June 846*
 prognosis *June 847*
 treatment *June 848*
- Pulmonary complications postoperative prevention and treatment by bronchoscopic aspiration *June 885*
- QUADRICEPS muscle adhesion of to femur *April 341*
 tendon rupture of *April 343*
- RECTAL bleeding differential diagnosis *June 831*
 Rectocele surgical repair *Feb 57*
 Rectosigmoid radical resection urinary tract complications following *June 827*
 Rectum carcinoma of *June 821*
 x ray treatment *June 865*
 papilloma of *June 859*
 polyps of *June 857*
 Reder's sign in chronic appendicitis *Feb 115*
 Reducible hernia ambulant treatment *April 513*
 Regional ileitis *June 763*
 Resection gastric technical difficulties *June 693*
 of presacral nerve in dysmenorrhea *June 92*
 radical of rectosigmoid urinary tract complications following *June 827*
 Retrobulbar optic neuritis in nasal sinus disease *Feb 220*
 Revivification operating room procedures *Feb 93*
 Rovsing's sign in chronic appendicitis *Feb 115*
 Rupture of crucial ligaments *April 381*
 of ligamentum patellae *April 345*
 of quadriceps tendon *April 343*
 Ruptured uterus *April 431*
- Semilunar cartilages derangements of
 diagnosis *April 322*
 differential *April 322*
 prognosis *April 328*
 treatment *April 323*
 external congenital abnormalities *April 331*
 injured acute bone atrophy following *April 355*
 operation for removal hemorrhage following *April 360*
- Serologic tests value of in obstetrics *Feb 71*
- Sinus disease nasal nervous system
 symptoms from *Feb 213*
 maxillary anatomy of *April 400*
 paranasals anatomy of *April 400*
 ethmoidal anatomy of *April 404*
 frontal anatomy of *April 403*
 nasal accessory anatomy *April 400*
 surgery *April 393 412*
 anesthesia in *April 414*
 preoperative details *April 413*
 x rays in *April 413*
 relation of to eye structures *April 409*
 sphenoidal *April 407*
- Sore nipples prevention and management *Feb 29*
- Spheno-ethmoidal recess *April 399*
- Sphenoidal sinuses anatomy *April 407*
- Spinal anesthesia for gastro-intestinal surgery *June 656*
 cord compression of clinical syndrome manifested by *April 559*
 metastatic tumor *April 568*
 tumors of differential diagnosis *April 559*
 paralysis of newborn *Feb 52*
- Spine cervical dislocations of treatment, *April 343*
 fractures of treatment *April 543*
- Stomach carcinoma of *June 629*
 factors influencing surgical relief and cure *June 651*
 in young *June 815*
 resection of technical difficulties *June 693*
- derangements of *April 315*
 clinical considerations *April 318*
- in newborn diagnosis *rev. 10*
 in obstetrics *Feb 67*
 diagnosis *Feb, 60*

- Neuritis retrobulbar optic in nasal sinus disease Feb 220*
Neuromuscular conditions of esophagus June, 618
Neuroses industrial diagnosis of April 537
treatment of April 537
Newborn asphyxia of Feb 41
aspiration of amniotic sac contents by Feb, 45
atelectasis of Feb 42
- OLFACTORY sulcus April 397*
Optic neuritis retrobulbar in nasal sinus disease Feb 220
Oral cavity and esophagus chemical burns April 585
Osteomyelitis chronic pedicle graft for Feb 185
Ostium maxillaris April 401
Oxalic acid burns of oral cavity and esophagus, April 587
- PAIN low back with sciatica diagnosis and treatment Feb 251*
symptom in nasal sinus disease Feb 213
Pancreas carcinoma of June 753
Pancreatitis acute April 473
chronic April 483
Papilloma of rectum June 859
Paralysis infantile correction of deformities of lower extremity in Feb 227
spinal of newborn Feb 52
Pars membranacea April 401
Patella See Knee joint
Pedicle graft for chronic osteomyelitis Feb 185
Pellegrini Stieda's disease April 389
Pelvis contracted management of labor in April 433
Pelvic lacerations surgical repair Feb 55
Pelvis female benign lesions irradiation treatment April 465
tumors of differential diagnosis April 457
- Peptic ulcer, chronic appendicitis simulating Feb 138*
indications for surgery June 621
of esophagus June 614
Perineorrhaphy postoperative care Feb 64
Perineum lacerations of third degree surgical repair Feb 63
Pharyngo-esophageal diverticulum June 606
traction June 610
- ical value June 113*
Placenta normally implanted premature separation April 473
prævia total s treated by bag insertion April 421
by cesarean section April 422
Polomyelitis correction of deformities of lower extremity in Feb 277
Polyps of colon June 857
of rectum June 857
Postoperative pulmonary complications prevention and treatment by bronchoscopic aspiration June 885
Postpartum hemorrhage, April 428
delayed April 430
immediate April 430
succenturiate lobe April 429
phlebotomy management Feb 33
Postural drainage in bronchiectasis Feb 195
Pregnancy care of breasts in Feb 27
ectopic diagnosis of April 441 450
differential April 452
pathology of April 447
symptoms of April 448
treatment of April 441 454
effect of syphilis on Feb 73
on syphilis Feb 69
late hemorrhages of April 417
Premature separation of normally implanted placenta April 423
Presacral neurectomy in dysmenorrhea June 927
Preventriculos June 604
Prolapse of uterus second degree surgical repair Feb 61
third degree surgical repair Feb 62



- Symphysis obstetric mode of trans-
mission *Feb* 72
treatment *Feb* 7
value of serologic tests *Feb* 71
- THORACO-EPIGASTRIC tubed pedicles
Feb 145 148
caterpillar *Feb* 146
closure of defect *Feb* 166
delayed *Feb* 147
donor areas *Feb* 151
dressings *Feb* 170
- Tumor of spinal cord differential d-
agnosis *April* 359
Turbinate bones anatomy *April* 395
middle anatomy of *April* 396
superior *April* 398
supreme *April* 399
- ULCER duodenal bleeding treatment
of *June* 687
peptic chronic appendicitis sim-
ulating *Feb* 138
indications for surgery *June* 671
" " " " " " " "

- Tibial metaphysis proximal dis-
location of *April* 374
Tract on diverticulum of esophagus
" " " "
- of
ruptured *April* 431
- and

- Tuberculosis of ileocecal region
chronic appendicitis and differen-
tiation *Feb* 130
- Tumor giant cell of cervical spine
Feb 243
- on
one
- on diminution of nasal sinus
disease *Feb* 220
- WALKING irons use of unpadded casts
" " " " " " " "

611

- of female pelvis differential diag-
nosis *April* 457
- x RAYS of nasal accessory sinuses
April 415

